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Parchment et al.

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(54) **VEHICLE DAMAGE ASSESSMENT USING 3D SCANNING**

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(73) Assignee: **Liberty Mutual Insurance Company**, Boston, MA (US)

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(21) Appl. No.: **14/332,173**

(22) Filed: **Jul. 15, 2014**

Related U.S. Application Data

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(51) **Int. Cl.**
G06Q 40/08 (2012.01)
H04W 4/16 (2009.01)
H04L 29/08 (2006.01)

(52) **U.S. Cl.**
CPC ***G06Q 40/08*** (2013.01); ***H04L 67/12*** (2013.01); ***H04W 4/16*** (2013.01)

(58) **Field of Classification Search**
None
See application file for complete search history.

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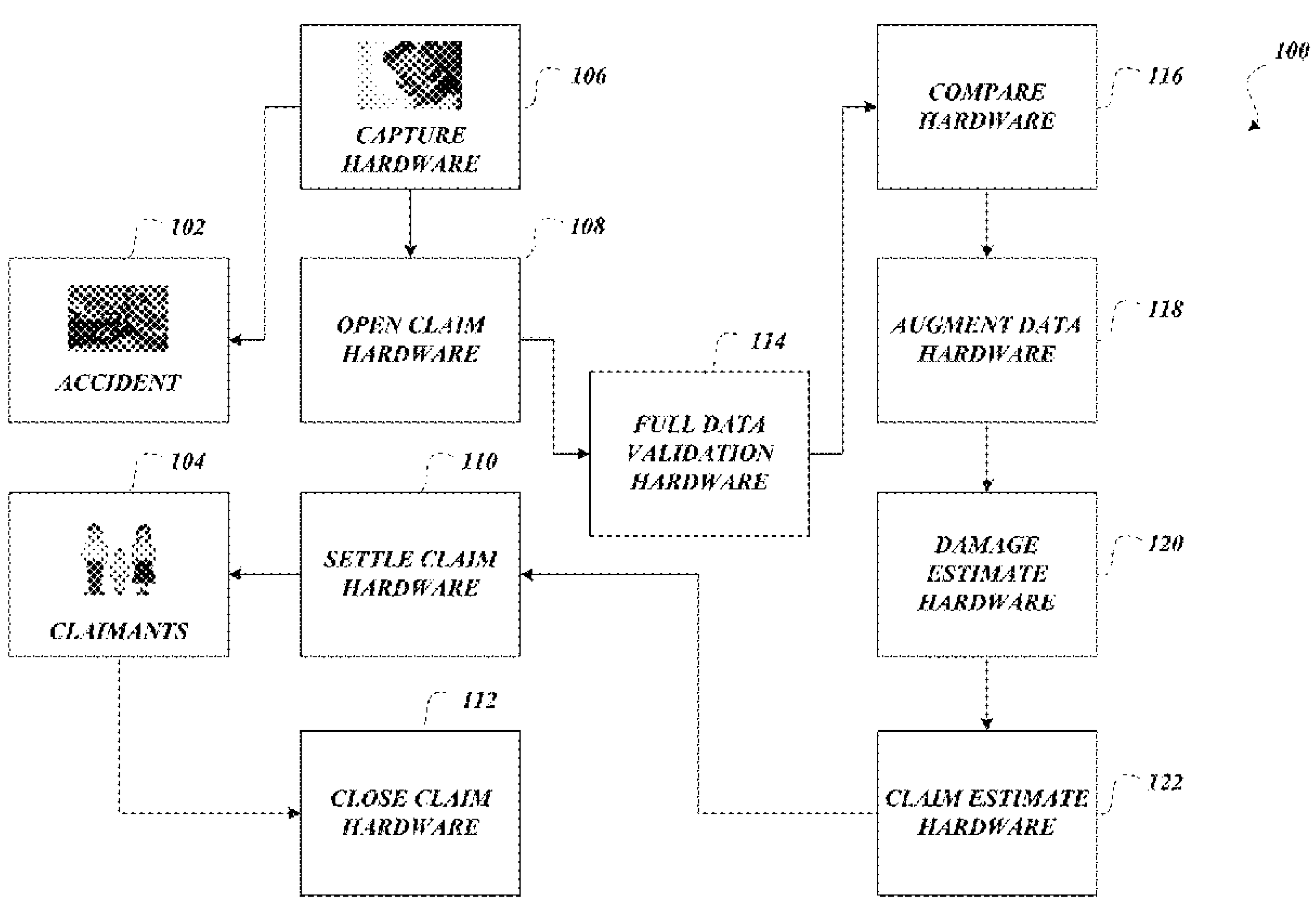
(74) *Attorney, Agent, or Firm* — Christensen O'Connor Johnson Kindness PLLC

(57) **ABSTRACT**

Automated claims adjustment is engineered to receive submission of two-dimensional data or three-dimensional data from a structured-light scan and other pieces of information directly via a mobile device. Upon receiving sufficient information to open a claim, automated claims adjustment and settlement processes are executed aiding and guiding a claimant. This reduces the time involved by the claimant in waiting for a claims adjuster to manually review a specific case file.

16 Claims, 28 Drawing Sheets



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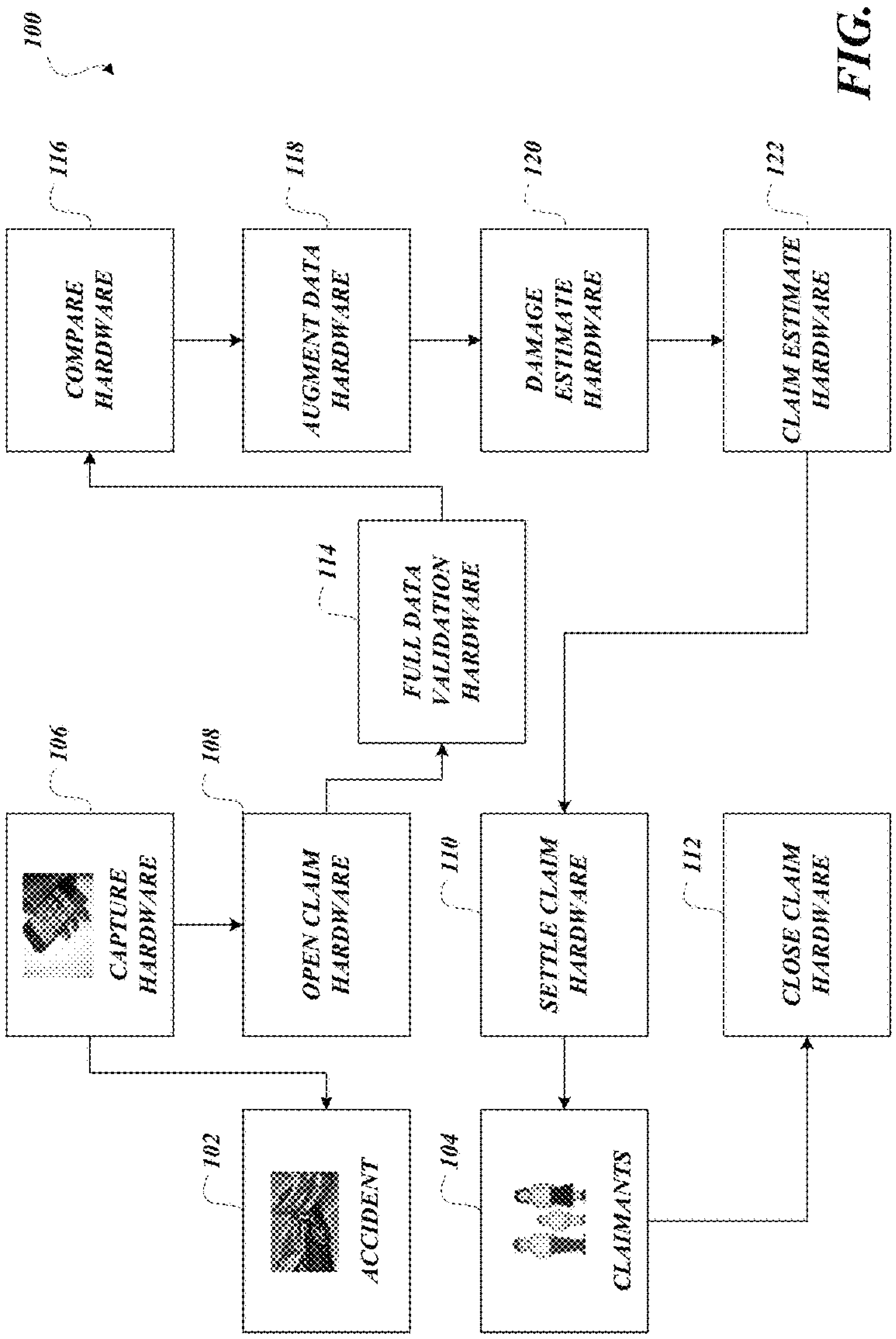

100
COMPARE HARDWARE
116
AUGMENT DATA HARDWARE
118
DAMAGE ESTIMATE HARDWARE
120
CLAIM ESTIMATE HARDWARE
122
FULL DATA VALIDATION HARDWARE
114
CAPTURE HARDWARE
106
OPEN CLAIM HARDWARE
108
SETTLE CLAIM HARDWARE
110
CLOSE CLAIM HARDWARE
112
ACCIDENT
102
CLAIMANTS
104

FIG. 1

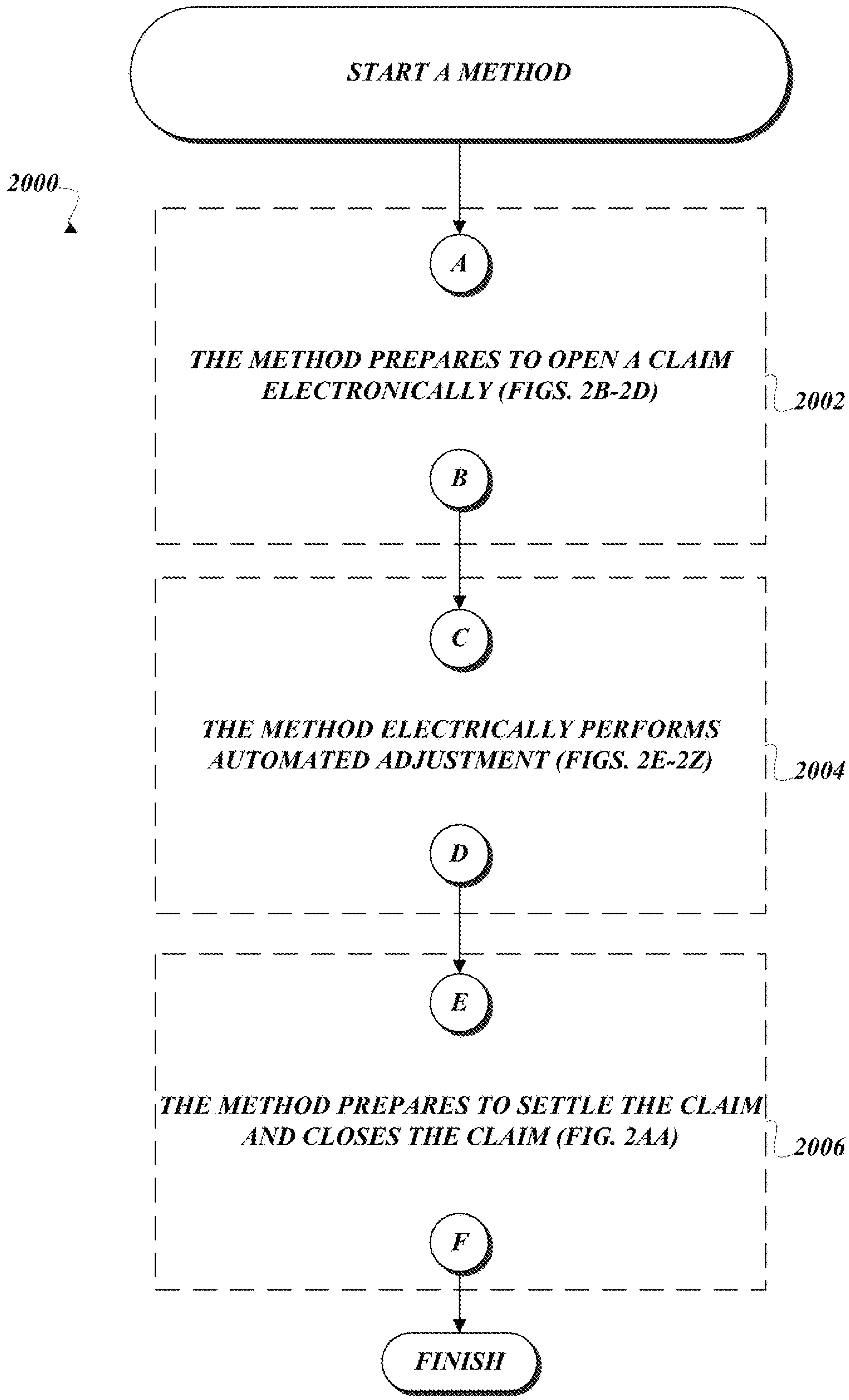

START A METHOD
2000
A
THE METHOD PREPARES TO OPEN A CLAIM ELECTRONICALLY (FIGS. 2B-2D)
2002
B
C
THE METHOD ELECTRICALLY PERFORMS AUTOMATED ADJUSTMENT (FIGS. 2E-2Z)
2004
D
E
THE METHOD PREPARES TO SETTLE THE CLAIM AND CLOSES THE CLAIM (FIG. 2AA)
2006
F
FINISH

FIG. 2A

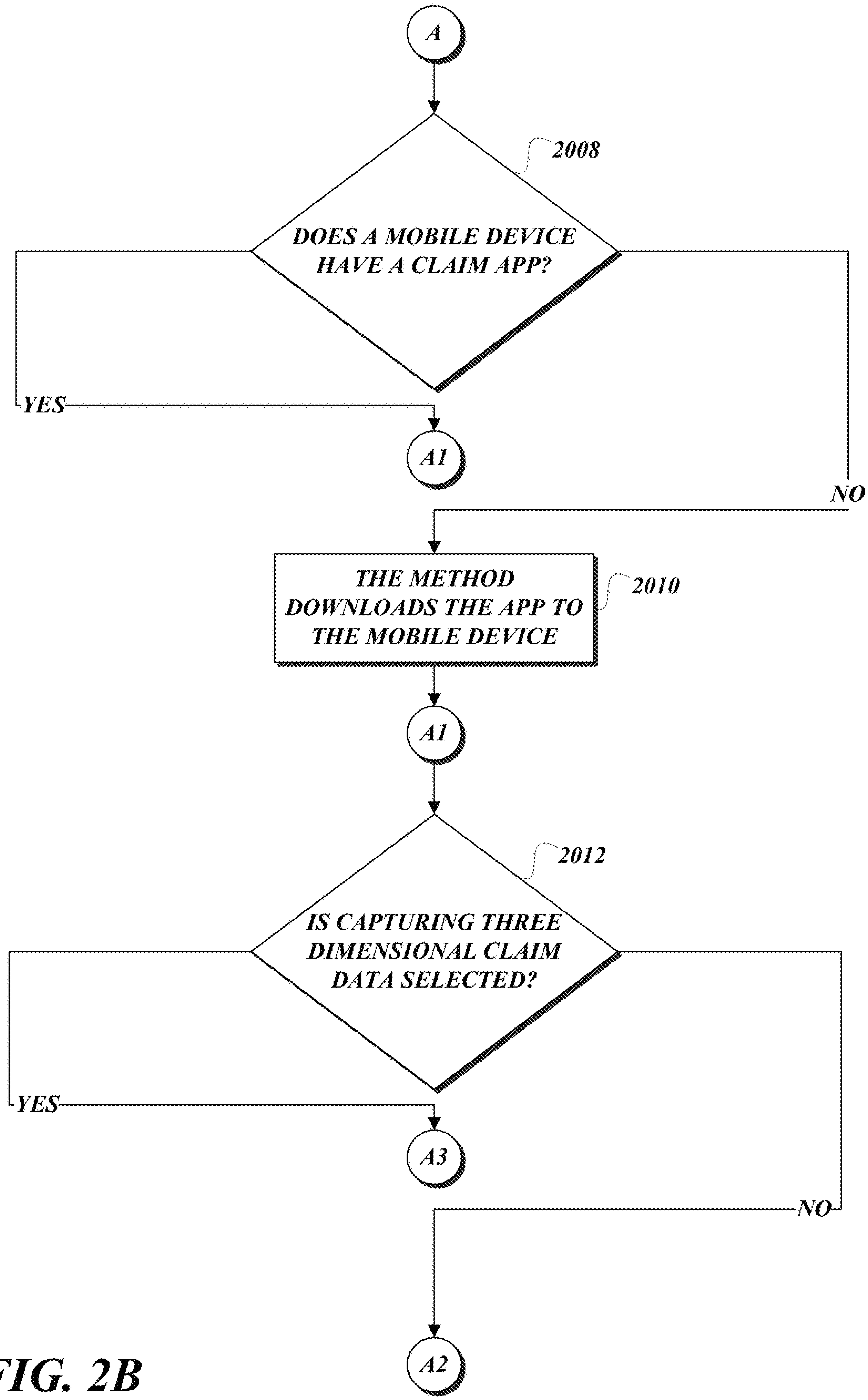

A
2008
DOES A MOBILE DEVICE HAVE A CLAIM APP?
YES
A1
NO
THE METHOD DOWNLOADS THE APP TO THE MOBILE DEVICE
2010
A1
2012
IS CAPTURING THREE DIMENSIONAL CLAIM DATA SELECTED?
YES
A3
NO
A2

FIG. 2B

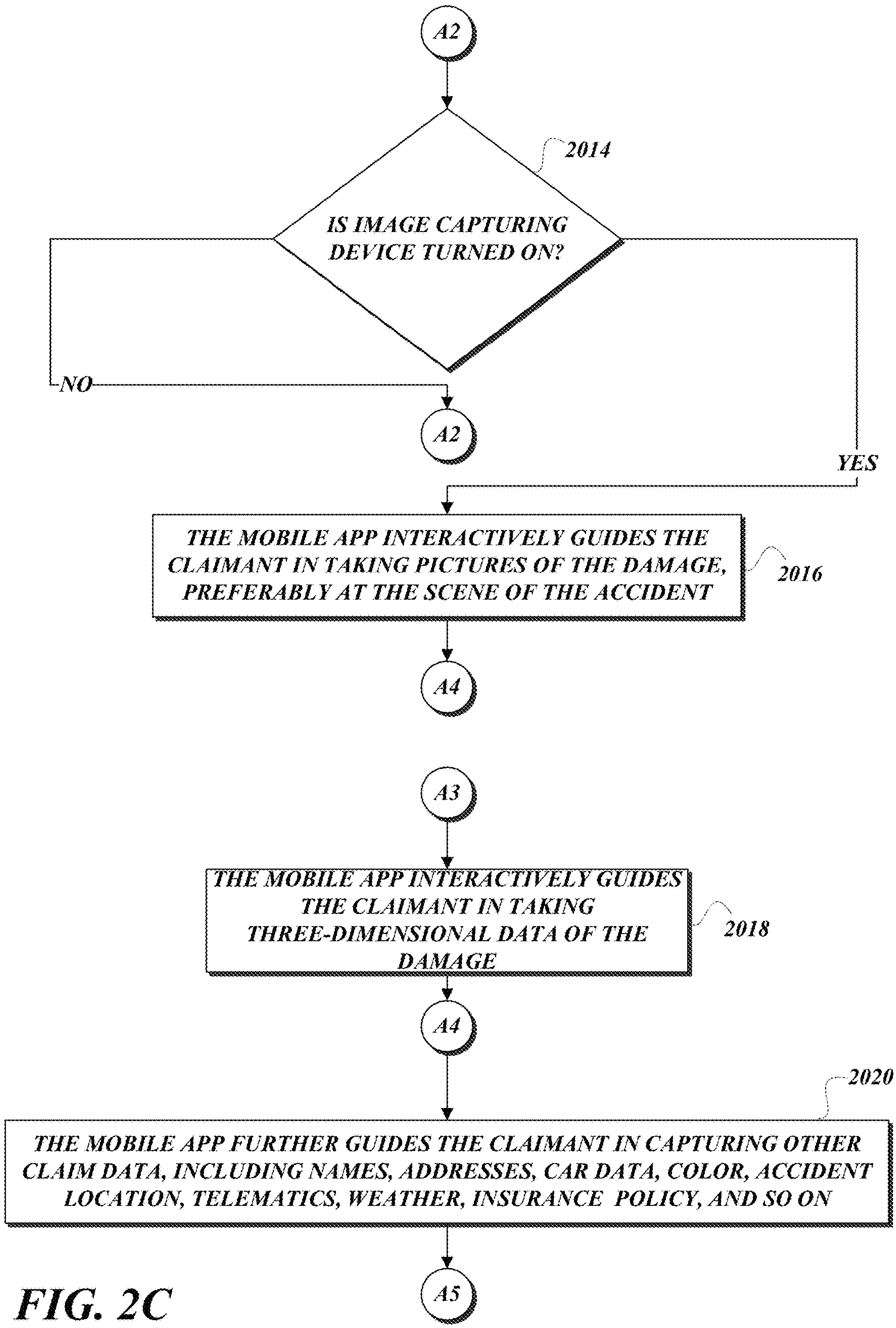

A2
2014
IS IMAGE CAPTURING DEVICE TURNED ON?
NO
A2
YES
THE MOBILE APP INTERACTIVELY GUIDES THE CLAIMANT IN TAKING PICTURES OF THE DAMAGE, PREFERABLY AT THE SCENE OF THE ACCIDENT
2016
A4
A3
THE MOBILE APP INTERACTIVELY GUIDES THE CLAIMANT IN TAKING THREE-DIMENSIONAL DATA OF THE DAMAGE
2018
A4
2020
THE MOBILE APP FURTHER GUIDES THE CLAIMANT IN CAPTURING OTHER CLAIM DATA, INCLUDING NAMES, ADDRESSES, CAR DATA, COLOR, ACCIDENT LOCATION, TELEMATICS, WEATHER, INSURANCE POLICY, AND SO ON
A5

FIG. 2C

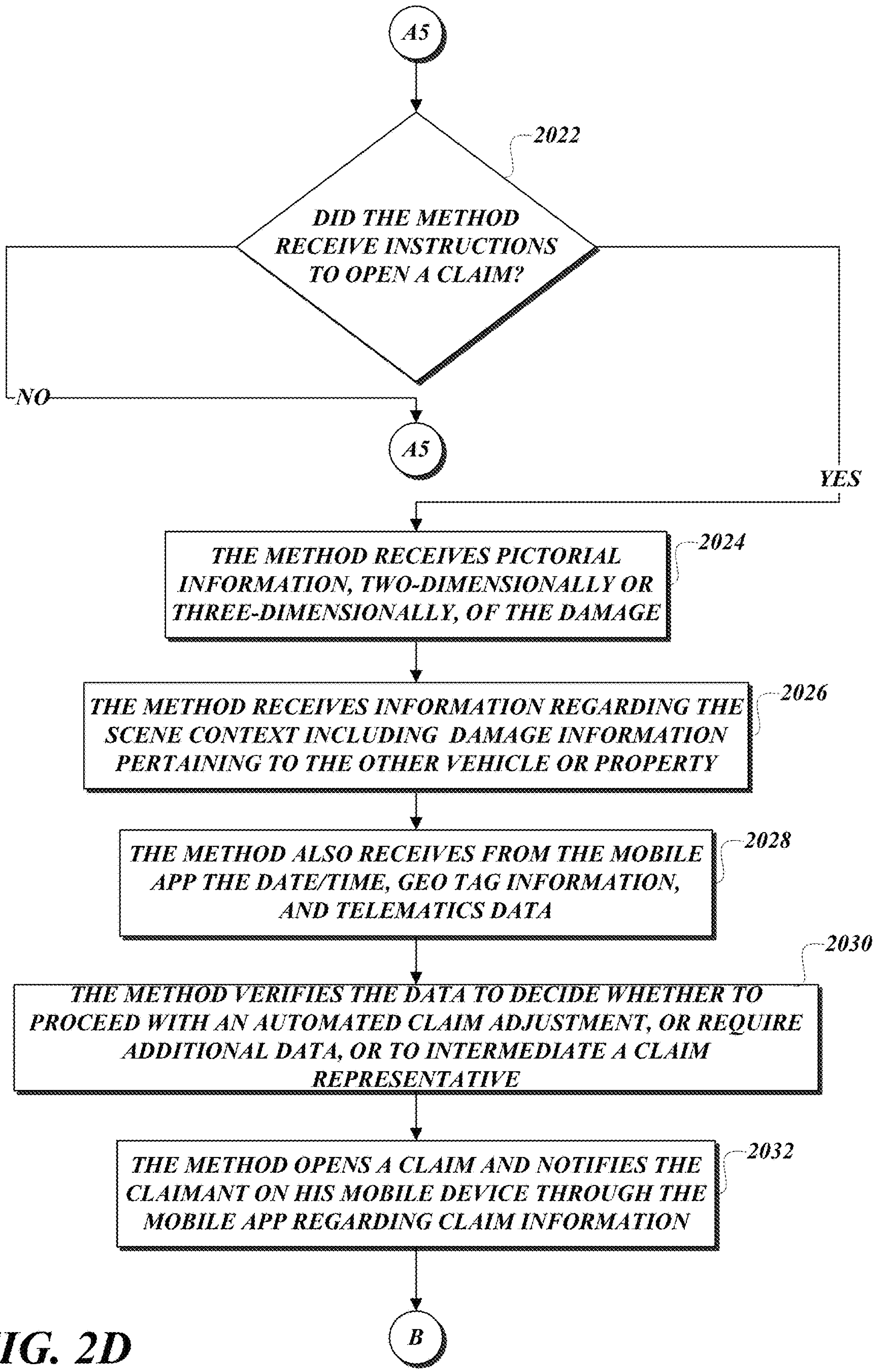

A5
2022
DID THE METHOD RECEIVE INSTRUCTIONS TO OPEN A CLAIM?
NO
A5
YES
THE METHOD RECEIVES PICTORIAL INFORMATION, TWO-DIMENSIONALLY OR THREE-DIMENSIONALLY, OF THE DAMAGE
2024
THE METHOD RECEIVES INFORMATION REGARDING THE SCENE CONTEXT INCLUDING DAMAGE INFORMATION PERTAINING TO THE OTHER VEHICLE OR PROPERTY
2026
THE METHOD ALSO RECEIVES FROM THE MOBILE APP THE DATE/TIME, GEO TAG INFORMATION, AND TELEMATICS DATA
2028
2030
THE METHOD VERIFIES THE DATA TO DECIDE WHETHER TO PROCEED WITH AN AUTOMATED CLAIM ADJUSTMENT, OR REQUIRE ADDITIONAL DATA, OR TO INTERMEDIATE A CLAIM REPRESENTATIVE
THE METHOD OPENS A CLAIM AND NOTIFIES THE CLAIMANT ON HIS MOBILE DEVICE THROUGH THE MOBILE APP REGARDING CLAIM INFORMATION
2032
B

FIG. 2D

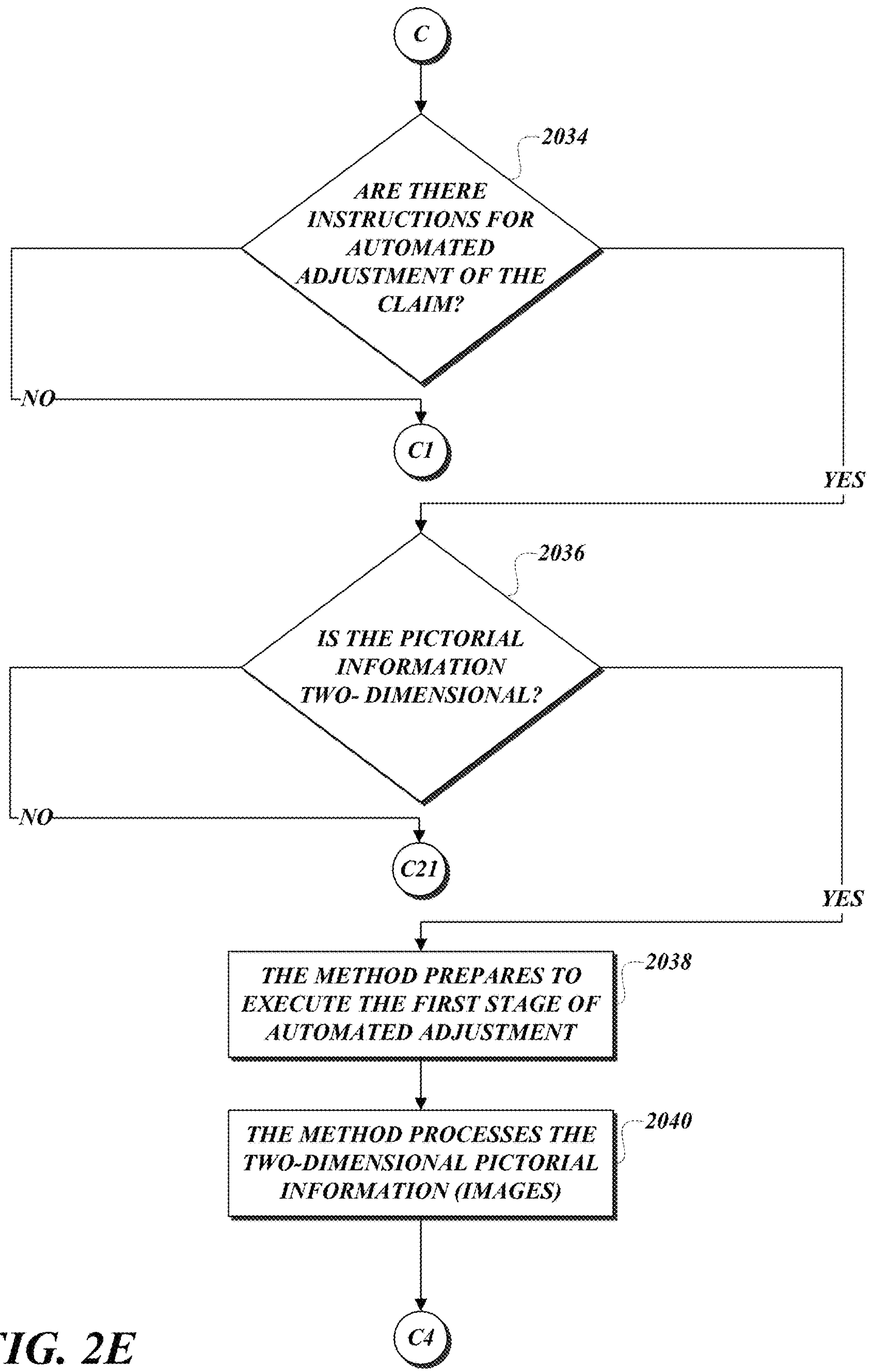

C
2034
ARE THERE INSTRUCTIONS FOR AUTOMATED ADJUSTMENT OF THE CLAIM?
NO
C1
YES
2036
IS THE PICTORIAL INFORMATION TWO- DIMENSIONAL?
NO
C21
YES
2038
THE METHOD PREPARES TO EXECUTE THE FIRST STAGE OF AUTOMATED ADJUSTMENT
2040
THE METHOD PROCESSES THE TWO-DIMENSIONAL PICTORIAL INFORMATION (IMAGES)
C4

FIG. 2E

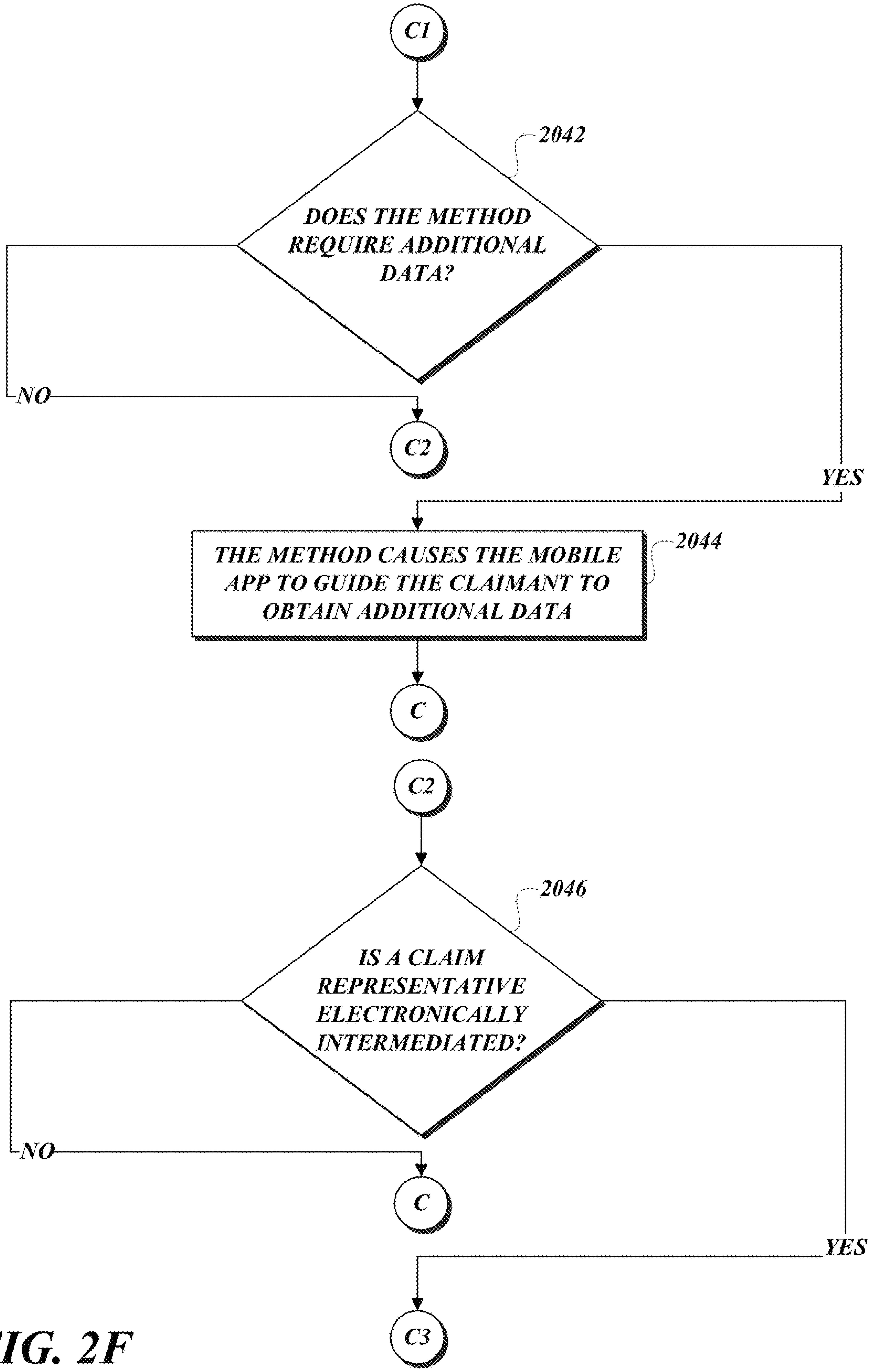

C1
2042
DOES THE METHOD REQUIRE ADDITIONAL DATA?
NO
YES
C2
THE METHOD CAUSES THE MOBILE APP TO GUIDE THE CLAIMANT TO OBTAIN ADDITIONAL DATA
2044
C
C2
2046
IS A CLAIM REPRESENTATIVE ELECTRONICALLY INTERMEDIATED?
NO
YES
C
C3

FIG. 2F

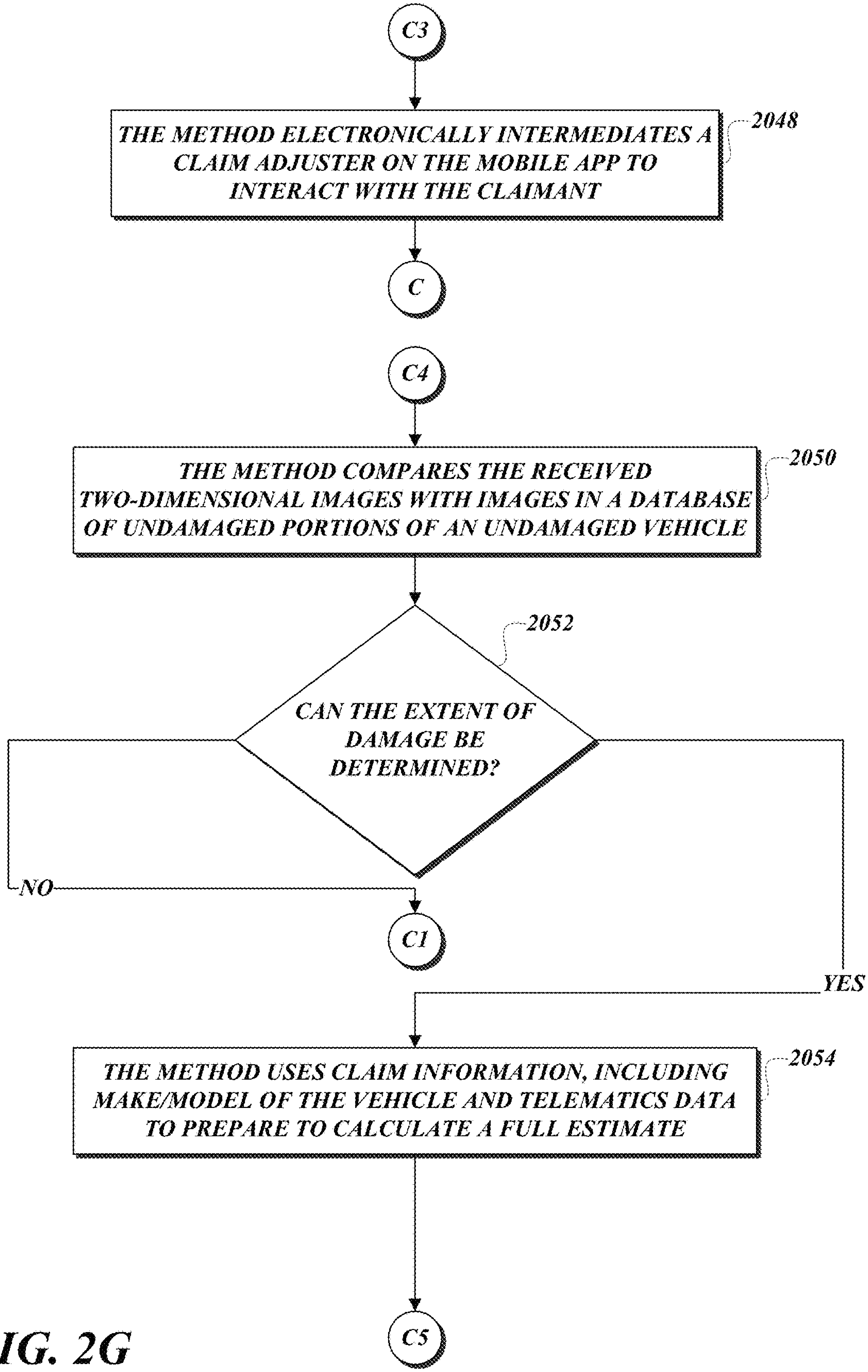

C3
THE METHOD ELECTRONICALLY INTERMEDIATES A CLAIM ADJUSTER ON THE MOBILE APP TO INTERACT WITH THE CLAIMANT
2048
C
C4
THE METHOD COMPARES THE RECEIVED TWO-DIMENSIONAL IMAGES WITH IMAGES IN A DATABASE OF UNDAMAGED PORTIONS OF AN UNDAMAGED VEHICLE
2050
CAN THE EXTENT OF DAMAGE BE DETERMINED?
2052
NO
C1
YES
THE METHOD USES CLAIM INFORMATION, INCLUDING MAKE/MODEL OF THE VEHICLE AND TELEMATICS DATA TO PREPARE TO CALCULATE A FULL ESTIMATE
2054
C5

FIG. 2G

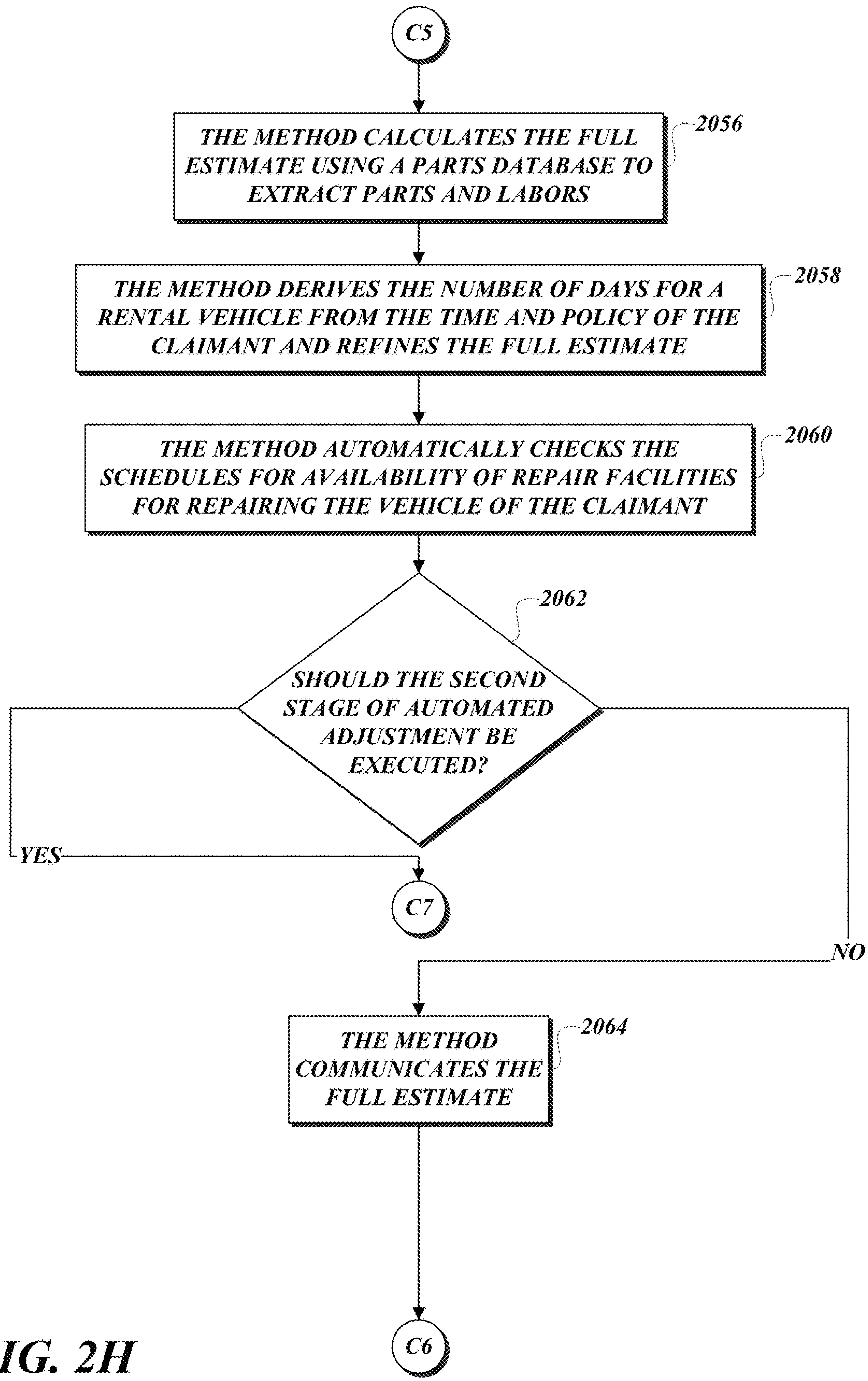

C5
THE METHOD CALCULATES THE FULL ESTIMATE USING A PARTS DATABASE TO EXTRACT PARTS AND LABORS
2056
THE METHOD DERIVES THE NUMBER OF DAYS FOR A RENTAL VEHICLE FROM THE TIME AND POLICY OF THE CLAIMANT AND REFINES THE FULL ESTIMATE
2058
THE METHOD AUTOMATICALLY CHECKS THE SCHEDULES FOR AVAILABILITY OF REPAIR FACILITIES FOR REPAIRING THE VEHICLE OF THE CLAIMANT
2060
SHOULD THE SECOND STAGE OF AUTOMATED ADJUSTMENT BE EXECUTED?
2062
YES
C7
NO
THE METHOD COMMUNICATES THE FULL ESTIMATE
2064
C6

FIG. 2H

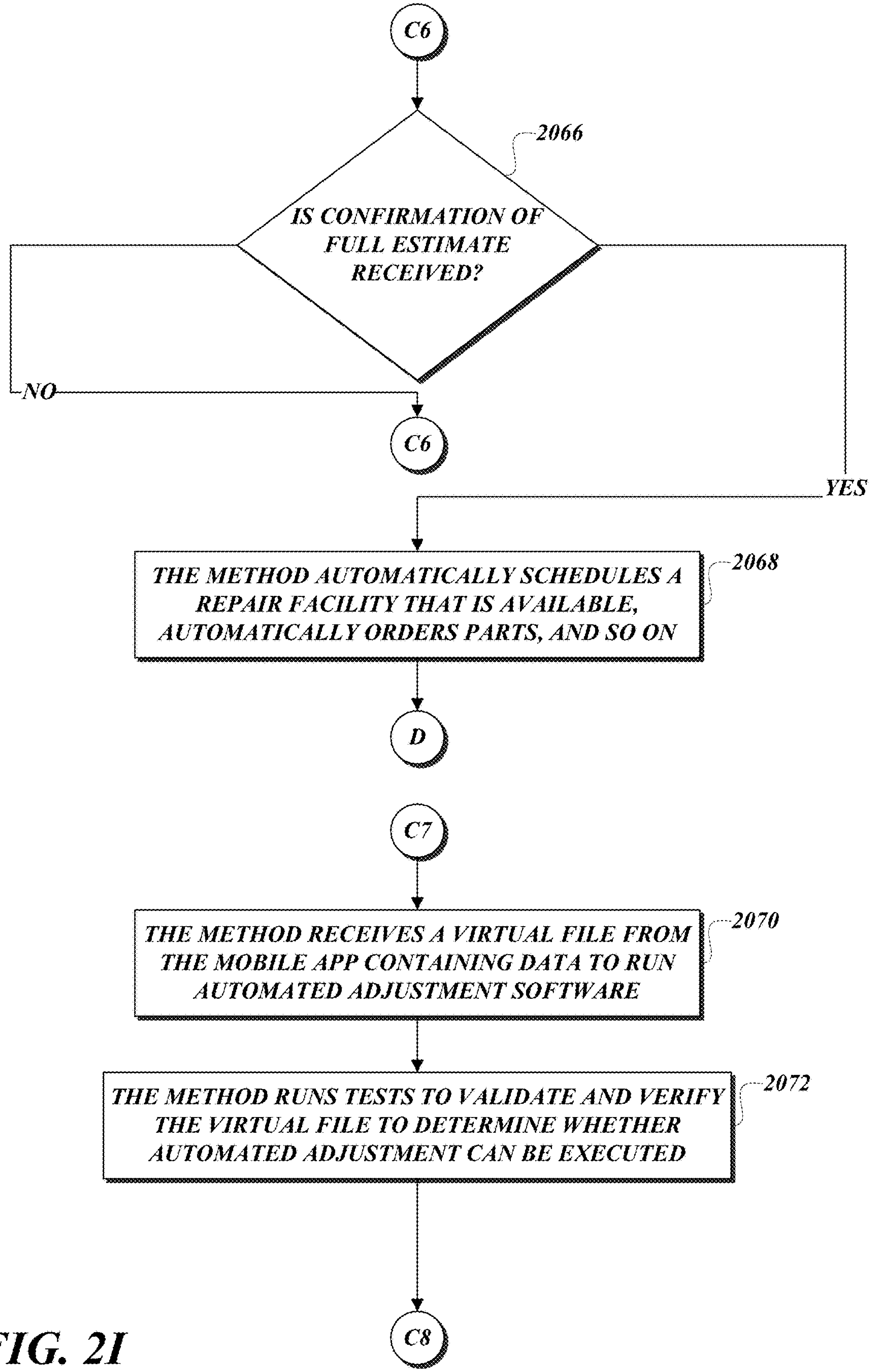

C6
2066
IS CONFIRMATION OF FULL ESTIMATE RECEIVED?
NO
C6
YES
THE METHOD AUTOMATICALLY SCHEDULES A REPAIR FACILITY THAT IS AVAILABLE, AUTOMATICALLY ORDERS PARTS, AND SO ON
2068
D
C7
THE METHOD RECEIVES A VIRTUAL FILE FROM THE MOBILE APP CONTAINING DATA TO RUN AUTOMATED ADJUSTMENT SOFTWARE
2070
THE METHOD RUNS TESTS TO VALIDATE AND VERIFY THE VIRTUAL FILE TO DETERMINE WHETHER AUTOMATED ADJUSTMENT CAN BE EXECUTED
2072
C8

FIG. 2I

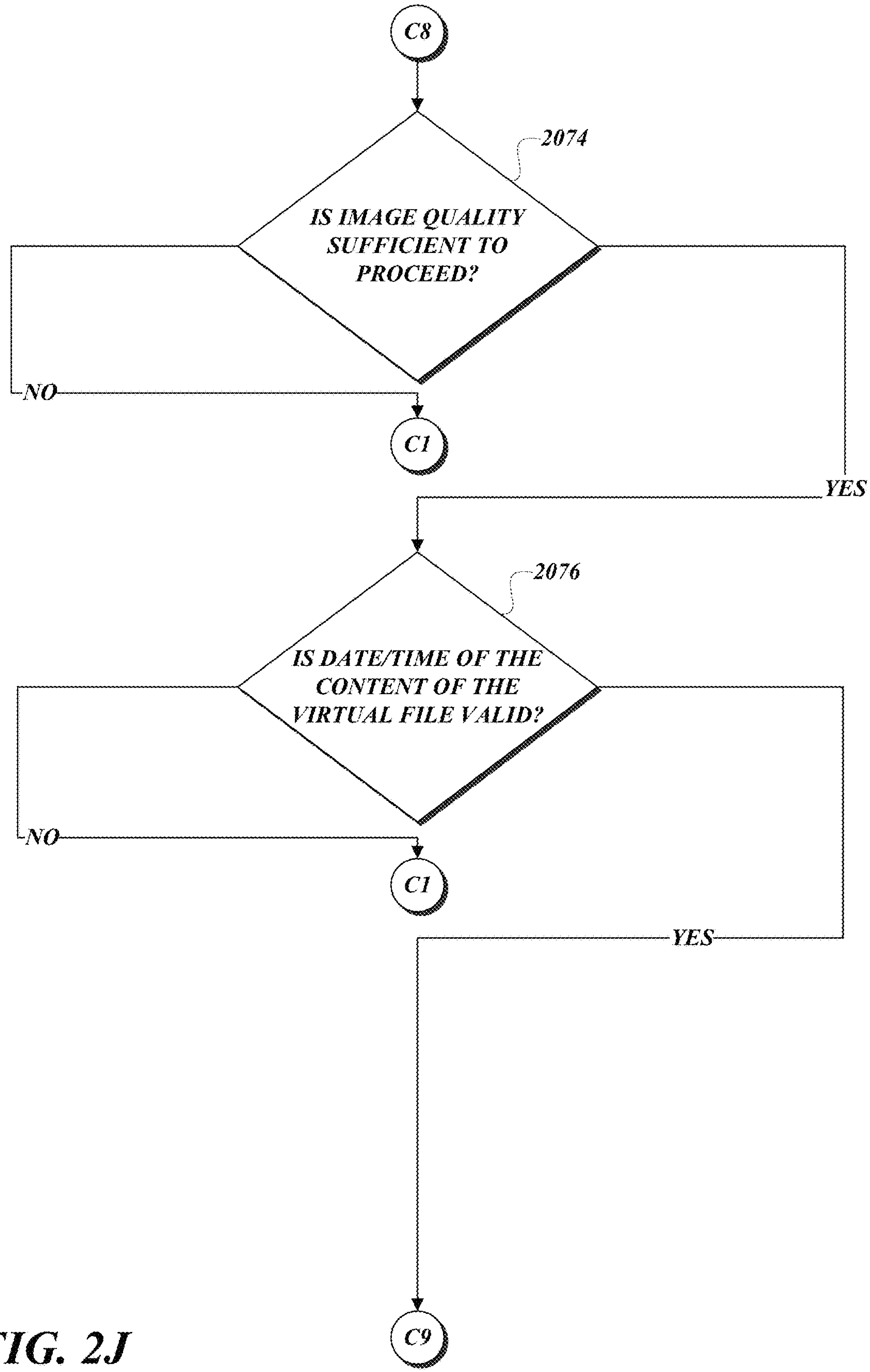

C8
2074
IS IMAGE QUALITY SUFFICIENT TO PROCEED?
NO
C1
YES
2076
IS DATE/TIME OF THE CONTENT OF THE VIRTUAL FILE VALID?
NO
C1
YES
C9

FIG. 2J

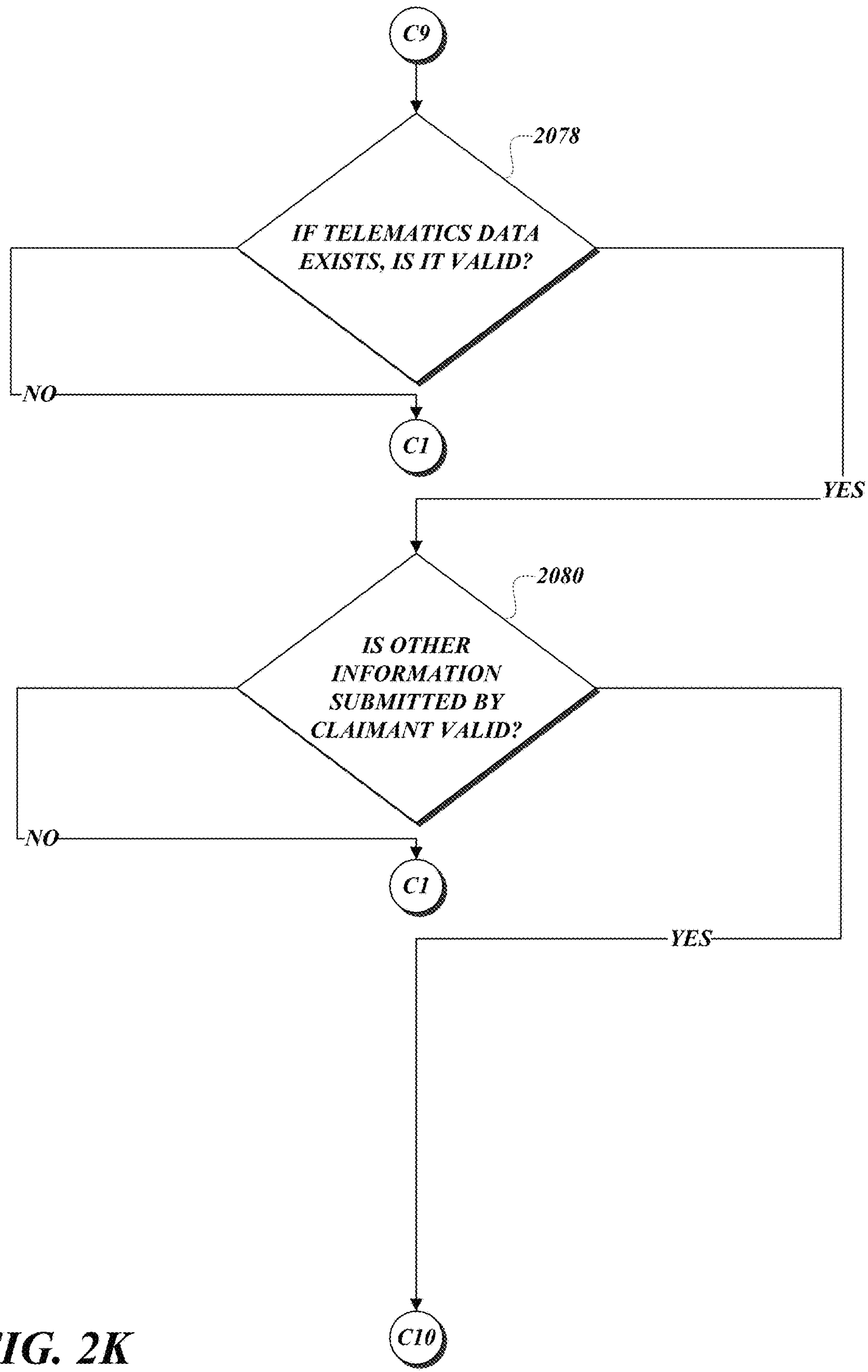
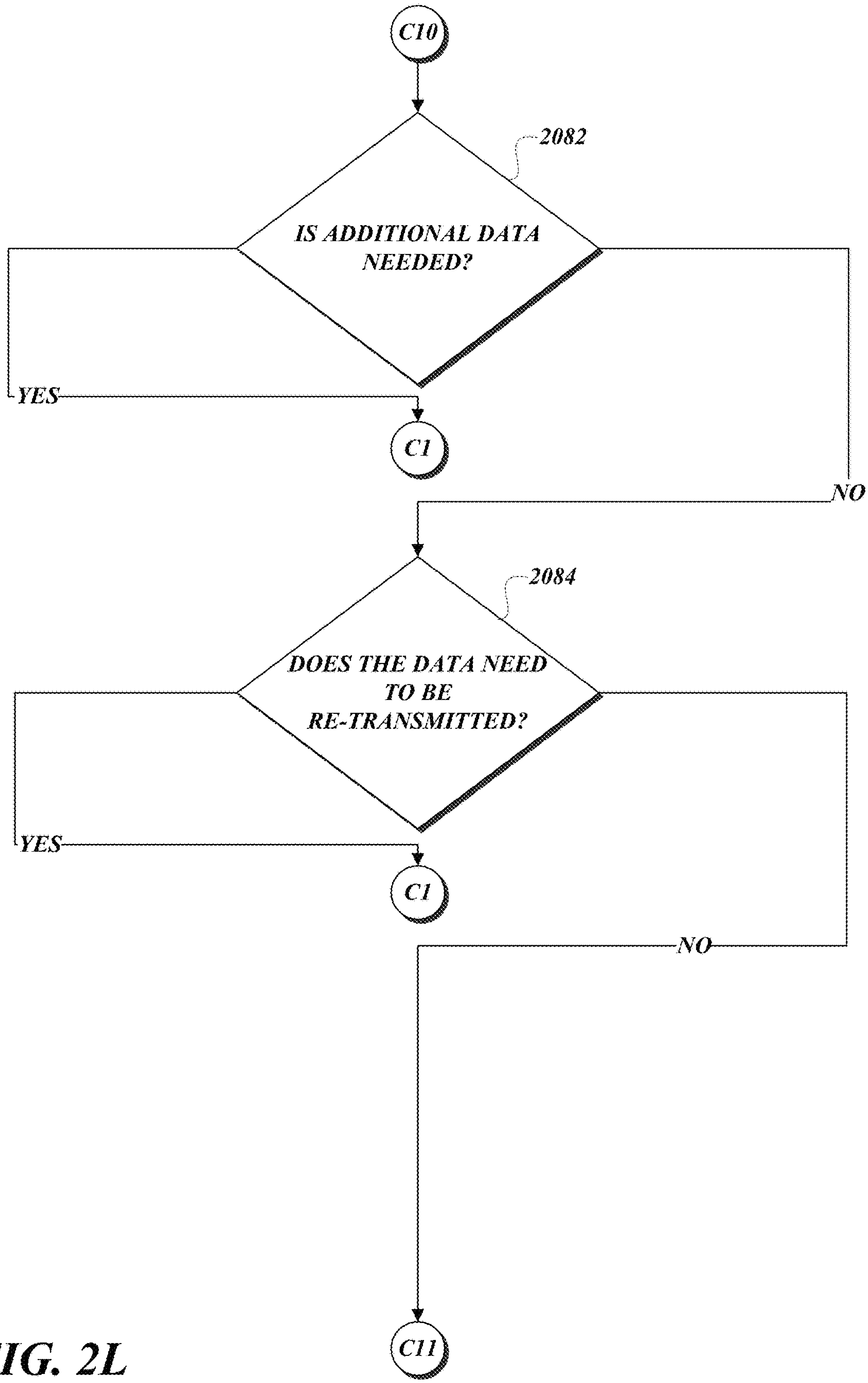

C9
2078
IF TELEMATICS DATA EXISTS, IS IT VALID?
NO
C1
YES
2080
IS OTHER INFORMATION SUBMITTED BY CLAIMANT VALID?
NO
C1
YES
C10

FIG. 2K



C10
2082
IS ADDITIONAL DATA NEEDED?
YES
C1
NO
2084
DOES THE DATA NEED TO BE RE-TRANSMITTED?
YES
C1
NO
C11

FIG. 2L

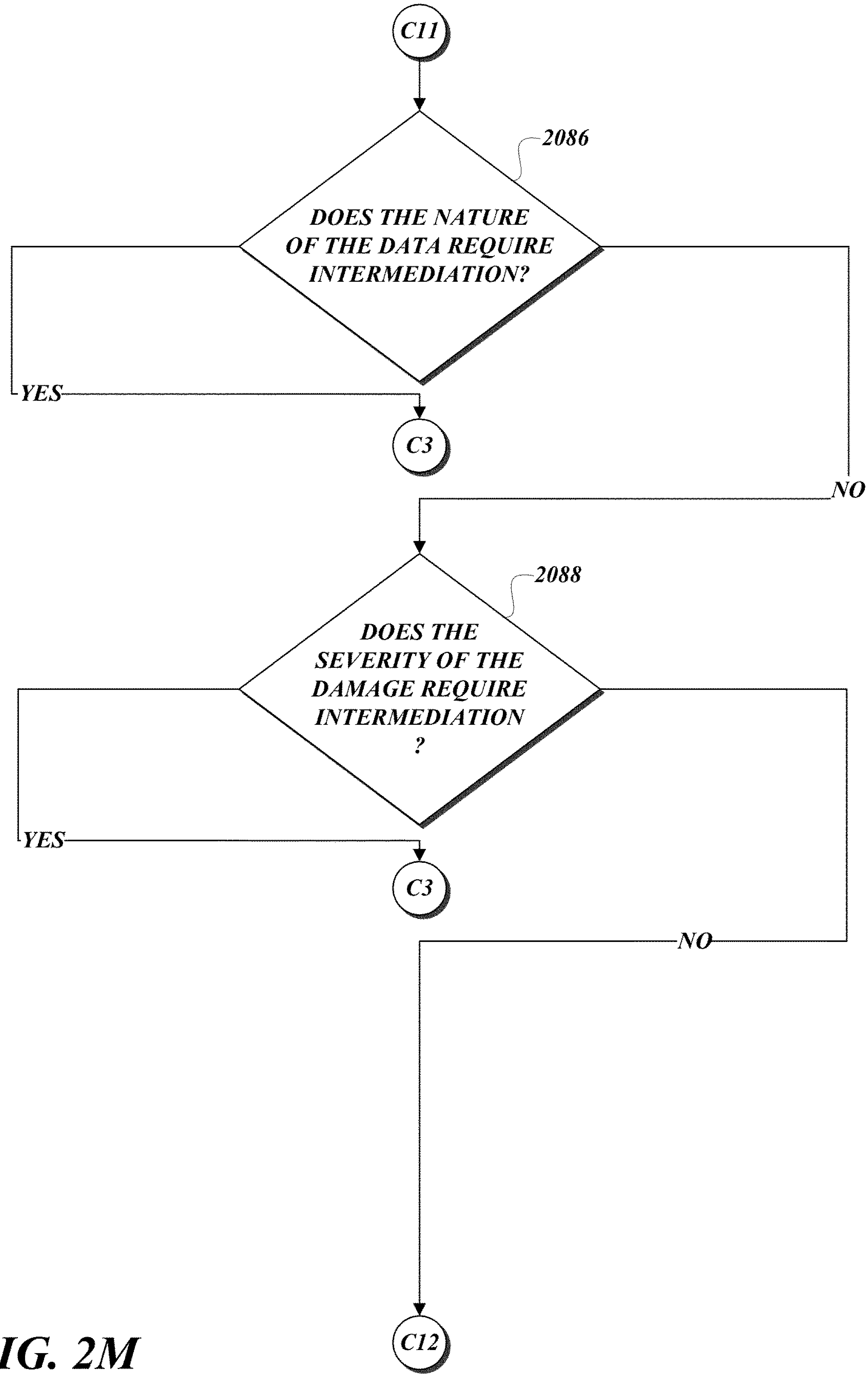

C11
2086
DOES THE NATURE OF THE DATA REQUIRE INTERMEDIATION?
YES
C3
NO
2088
DOES THE SEVERITY OF THE DAMAGE REQUIRE INTERMEDIATION ?
YES
C3
NO
C12

FIG. 2M

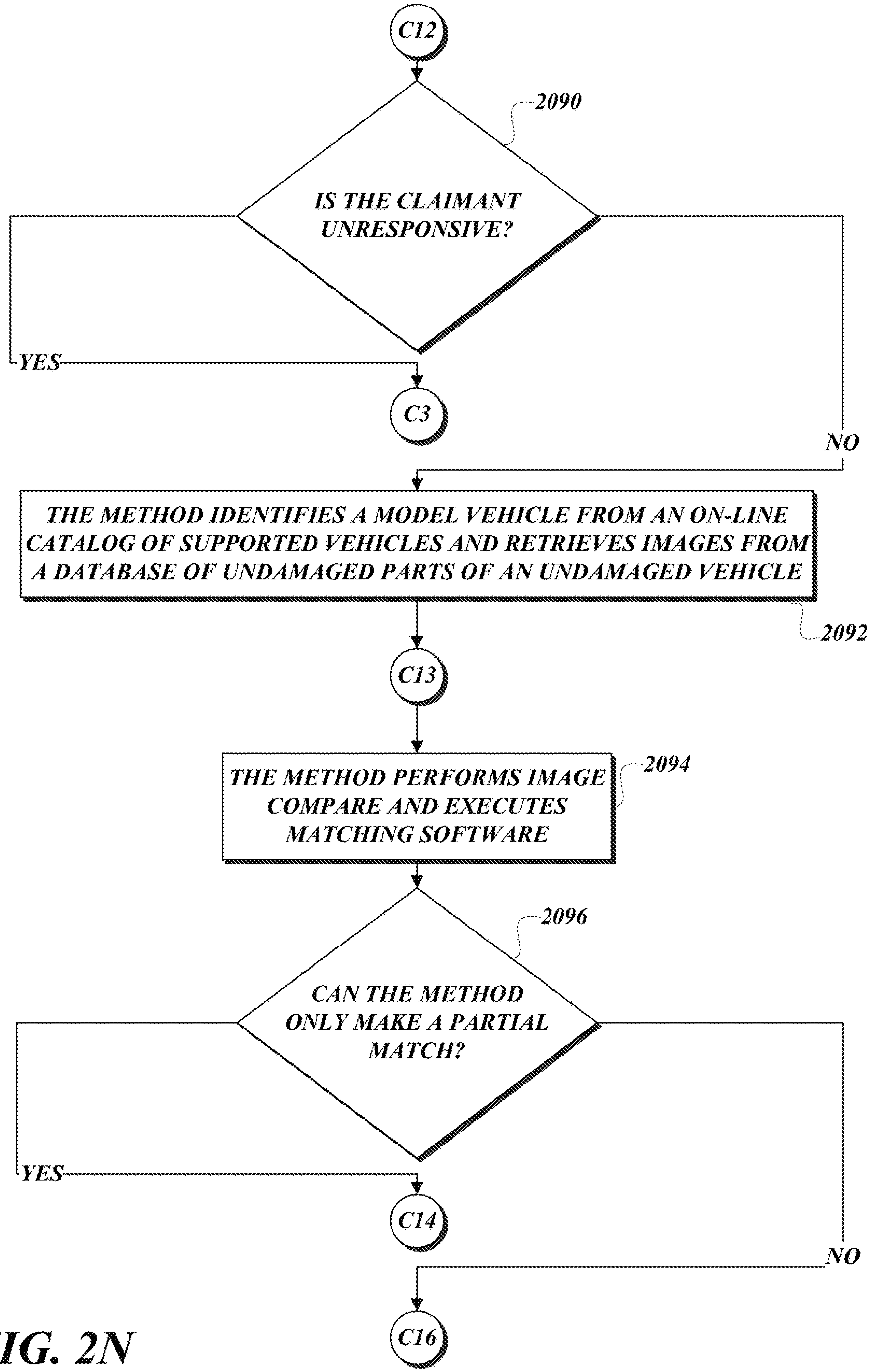

C12
2090
IS THE CLAIMANT UNRESPONSIVE?
YES
C3
NO
THE METHOD IDENTIFIES A MODEL VEHICLE FROM AN ON-LINE CATALOG OF SUPPORTED VEHICLES AND RETRIEVES IMAGES FROM A DATABASE OF UNDAMAGED PARTS OF AN UNDAMAGED VEHICLE
2092
C13
THE METHOD PERFORMS IMAGE COMPARE AND EXECUTES MATCHING SOFTWARE
2094
2096
CAN THE METHOD ONLY MAKE A PARTIAL MATCH?
YES
C14
NO
C16

FIG. 2N

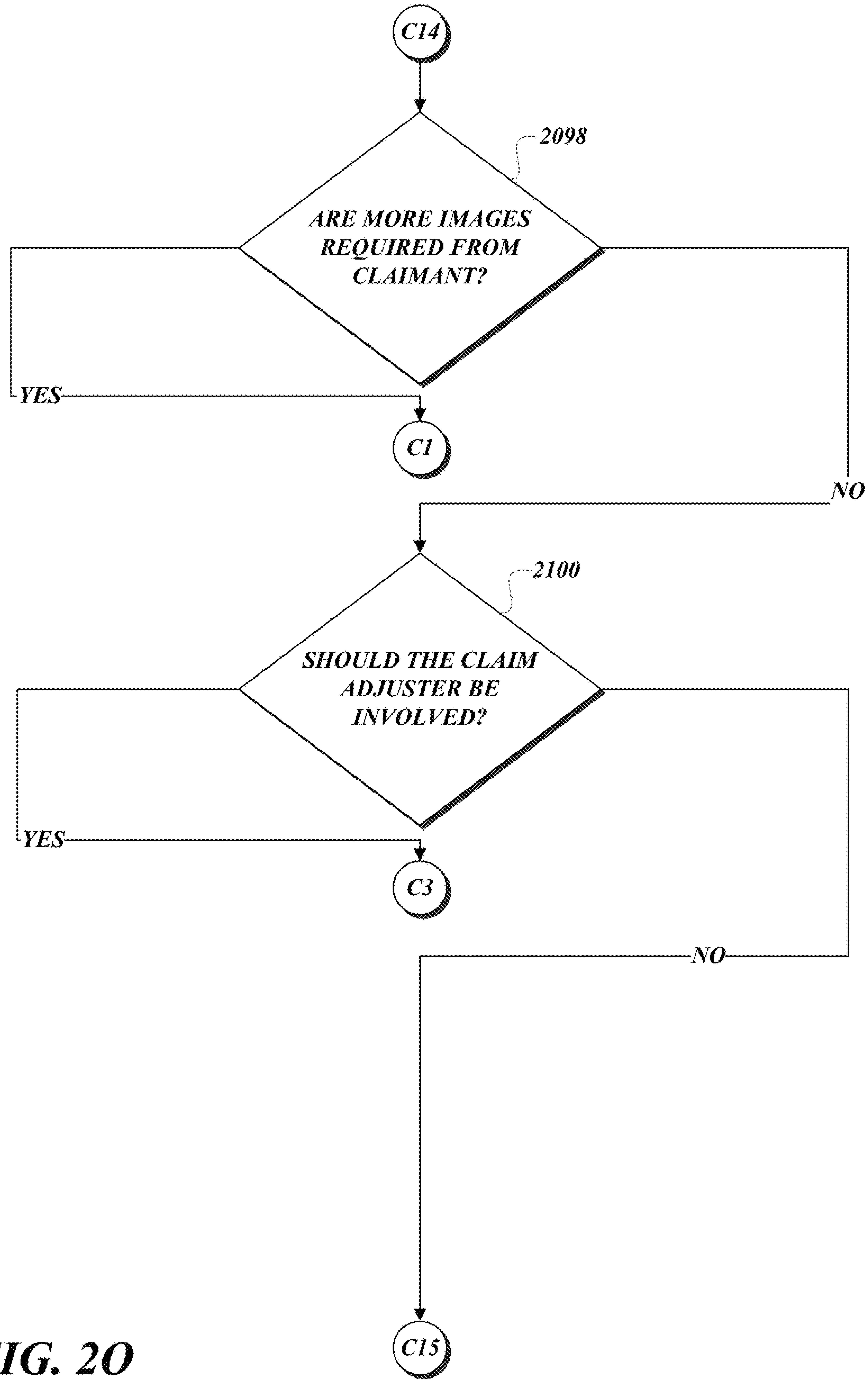

C14
2098
ARE MORE IMAGES REQUIRED FROM CLAIMANT?
YES
C1
NO
2100
SHOULD THE CLAIM ADJUSTER BE INVOLVED?
YES
C3
NO
C15

FIG. 2O

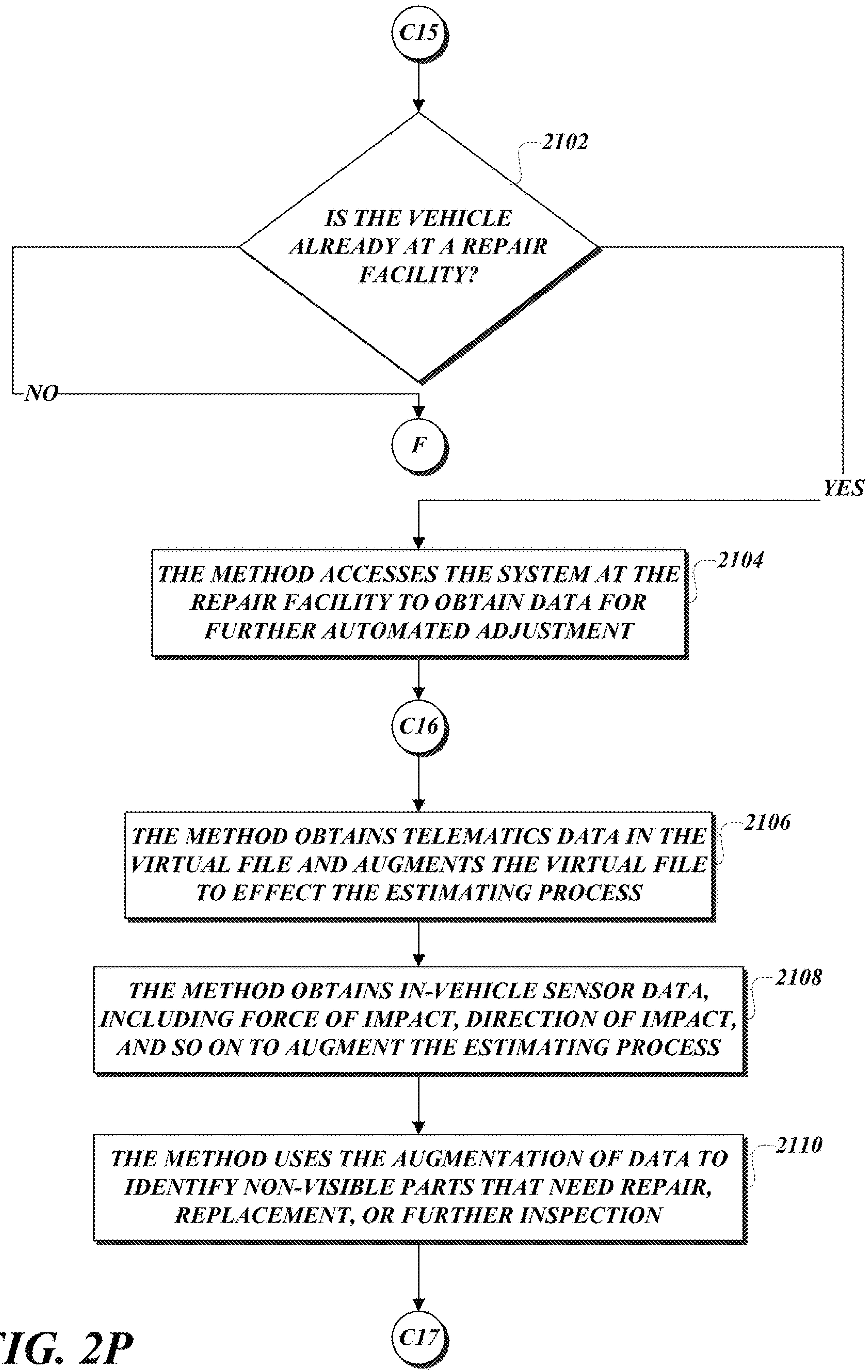

C15
2102
IS THE VEHICLE ALREADY AT A REPAIR FACILITY?
NO
F
YES
THE METHOD ACCESSES THE SYSTEM AT THE REPAIR FACILITY TO OBTAIN DATA FOR FURTHER AUTOMATED ADJUSTMENT
2104
C16
THE METHOD OBTAINS TELEMATICS DATA IN THE VIRTUAL FILE AND AUGMENTS THE VIRTUAL FILE TO EFFECT THE ESTIMATING PROCESS
2106
THE METHOD OBTAINS IN-VEHICLE SENSOR DATA, INCLUDING FORCE OF IMPACT, DIRECTION OF IMPACT, AND SO ON TO AUGMENT THE ESTIMATING PROCESS
2108
THE METHOD USES THE AUGMENTATION OF DATA TO IDENTIFY NON-VISIBLE PARTS THAT NEED REPAIR, REPLACEMENT, OR FURTHER INSPECTION
2110
C17

FIG. 2P

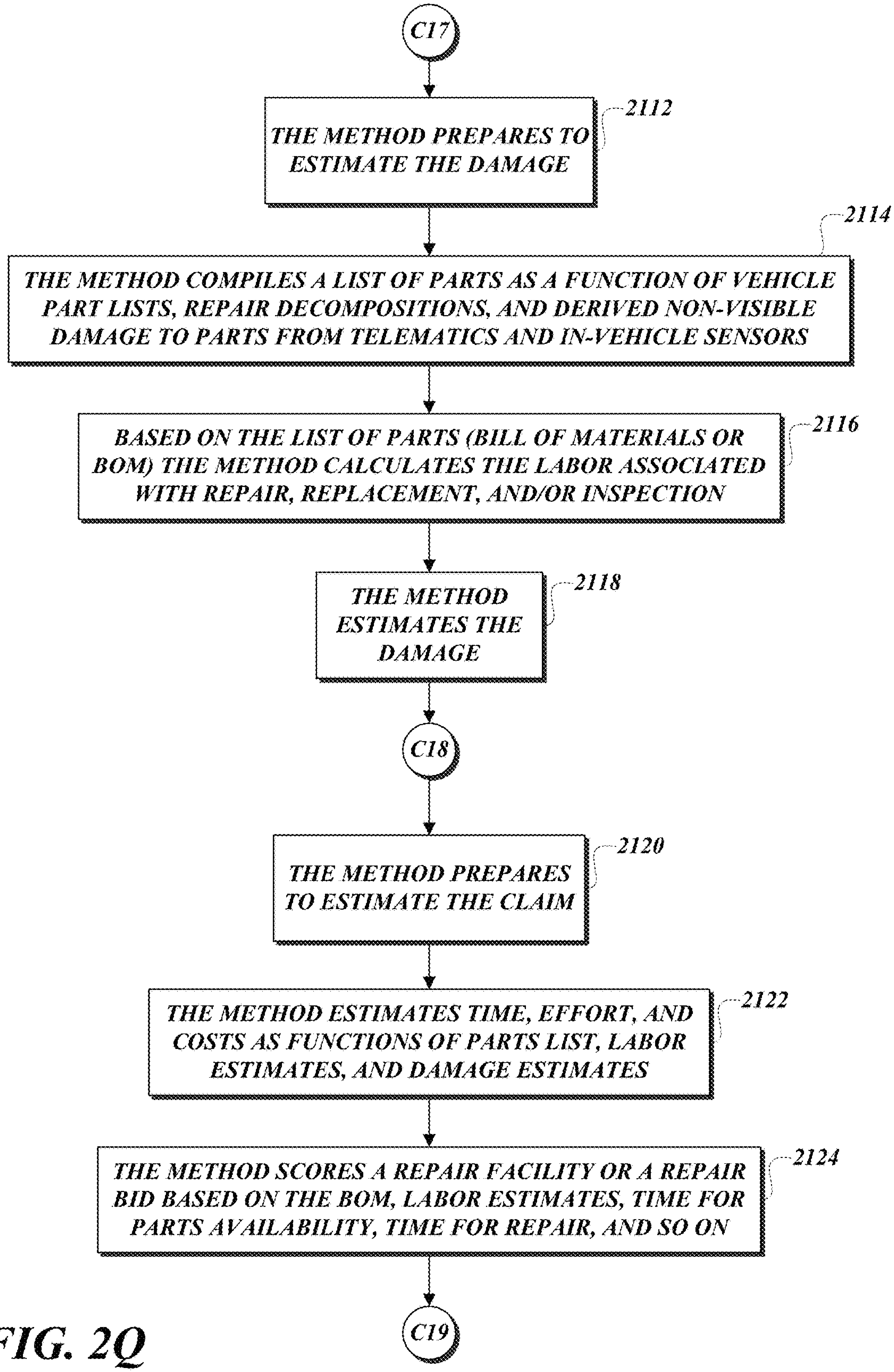

C17
THE METHOD PREPARES TO ESTIMATE THE DAMAGE
2112
THE METHOD COMPILES A LIST OF PARTS AS A FUNCTION OF VEHICLE PART LISTS, REPAIR DECOMPOSITIONS, AND DERIVED NON-VISIBLE DAMAGE TO PARTS FROM TELEMATICS AND IN-VEHICLE SENSORS
2114
BASED ON THE LIST OF PARTS (BILL OF MATERIALS OR BOM) THE METHOD CALCULATES THE LABOR ASSOCIATED WITH REPAIR, REPLACEMENT, AND/OR INSPECTION
2116
THE METHOD ESTIMATES THE DAMAGE
2118
C18
THE METHOD PREPARES TO ESTIMATE THE CLAIM
2120
THE METHOD ESTIMATES TIME, EFFORT, AND COSTS AS FUNCTIONS OF PARTS LIST, LABOR ESTIMATES, AND DAMAGE ESTIMATES
2122
THE METHOD SCORES A REPAIR FACILITY OR A REPAIR BID BASED ON THE BOM, LABOR ESTIMATES, TIME FOR PARTS AVAILABILITY, TIME FOR REPAIR, AND SO ON
2124
C19

FIG. 2Q

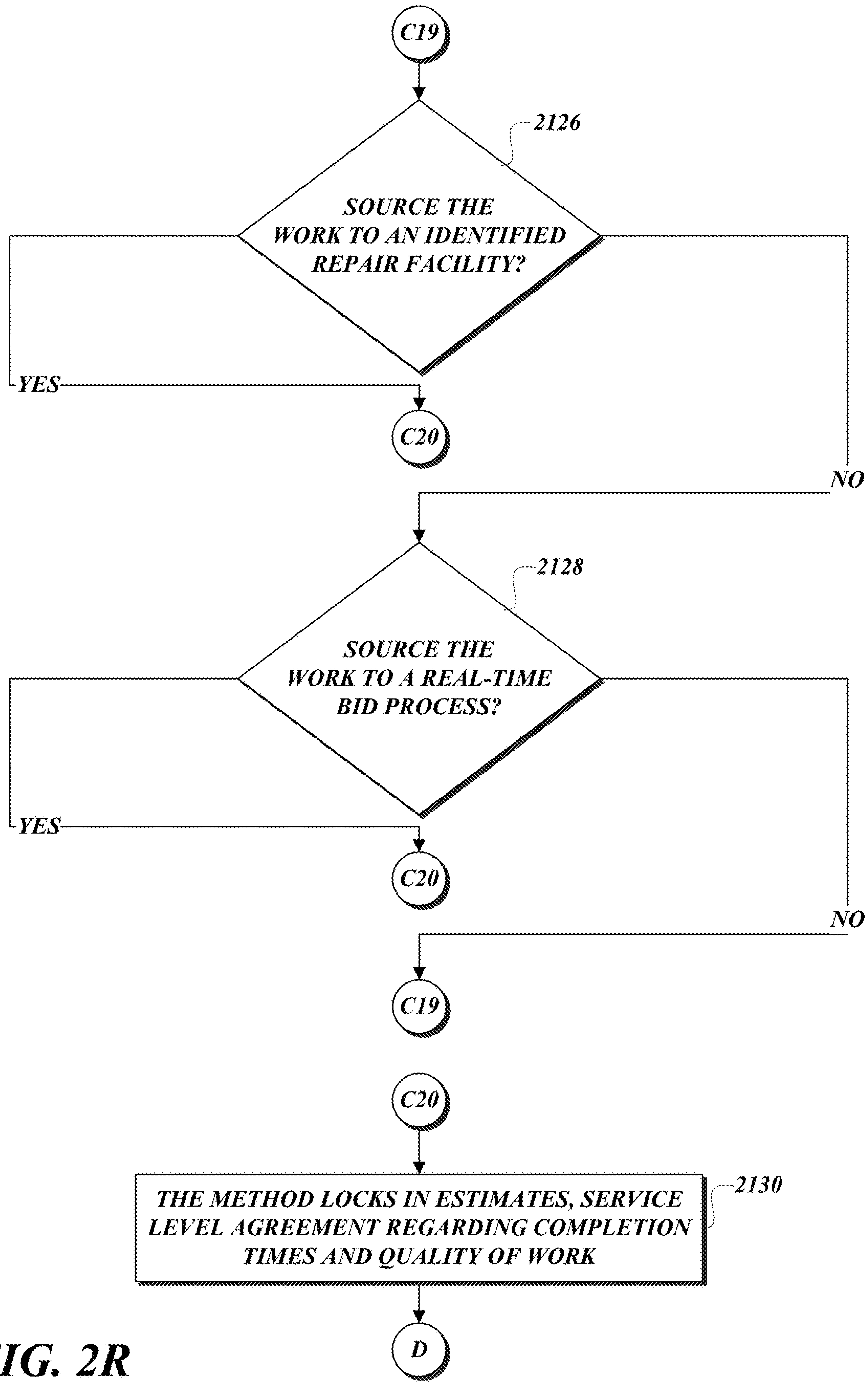

C19
2126
SOURCE THE WORK TO AN IDENTIFIED REPAIR FACILITY?
YES
C20
NO
2128
SOURCE THE WORK TO A REAL-TIME BID PROCESS?
YES
C20
NO
C19
C20
THE METHOD LOCKS IN ESTIMATES, SERVICE LEVEL AGREEMENT REGARDING COMPLETION TIMES AND QUALITY OF WORK
2130
D

FIG. 2R

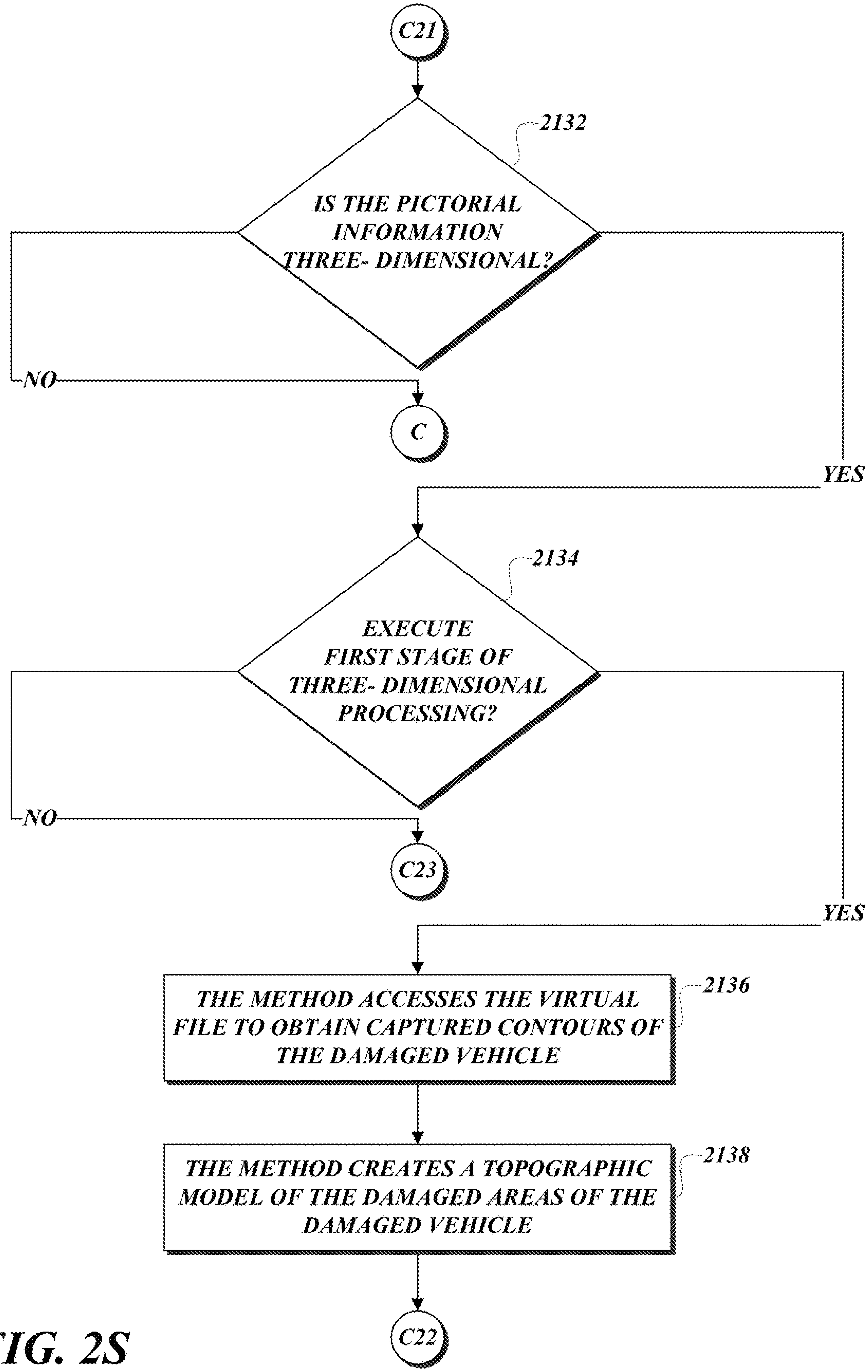

C21
2132
IS THE PICTORIAL INFORMATION THREE- DIMENSIONAL?
NO
C
YES
2134
EXECUTE FIRST STAGE OF THREE- DIMENSIONAL PROCESSING?
NO
C23
YES
THE METHOD ACCESSES THE VIRTUAL FILE TO OBTAIN CAPTURED CONTOURS OF THE DAMAGED VEHICLE
2136
THE METHOD CREATES A TOPOGRAPHIC MODEL OF THE DAMAGED AREAS OF THE DAMAGED VEHICLE
2138
C22

FIG. 2S

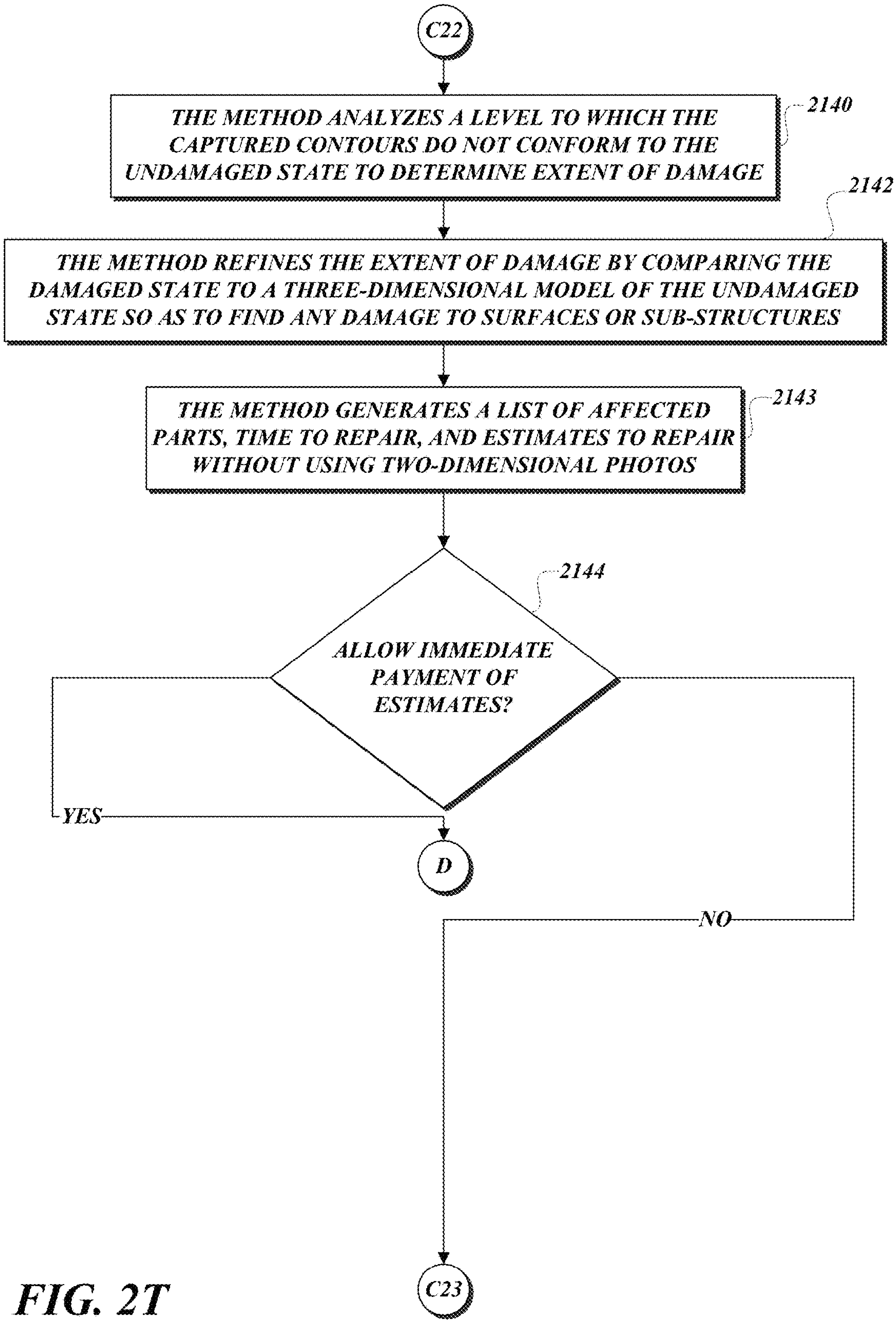

C22
THE METHOD ANALYZES A LEVEL TO WHICH THE CAPTURED CONTOURS DO NOT CONFORM TO THE UNDAMAGED STATE TO DETERMINE EXTENT OF DAMAGE
2140
THE METHOD REFINES THE EXTENT OF DAMAGE BY COMPARING THE DAMAGED STATE TO A THREE-DIMENSIONAL MODEL OF THE UNDAMAGED STATE SO AS TO FIND ANY DAMAGE TO SURFACES OR SUB-STRUCTURES
2142
THE METHOD GENERATES A LIST OF AFFECTED PARTS, TIME TO REPAIR, AND ESTIMATES TO REPAIR WITHOUT USING TWO-DIMENSIONAL PHOTOS
2143
ALLOW IMMEDIATE PAYMENT OF ESTIMATES?
2144
YES
D
NO
C23

FIG. 2T

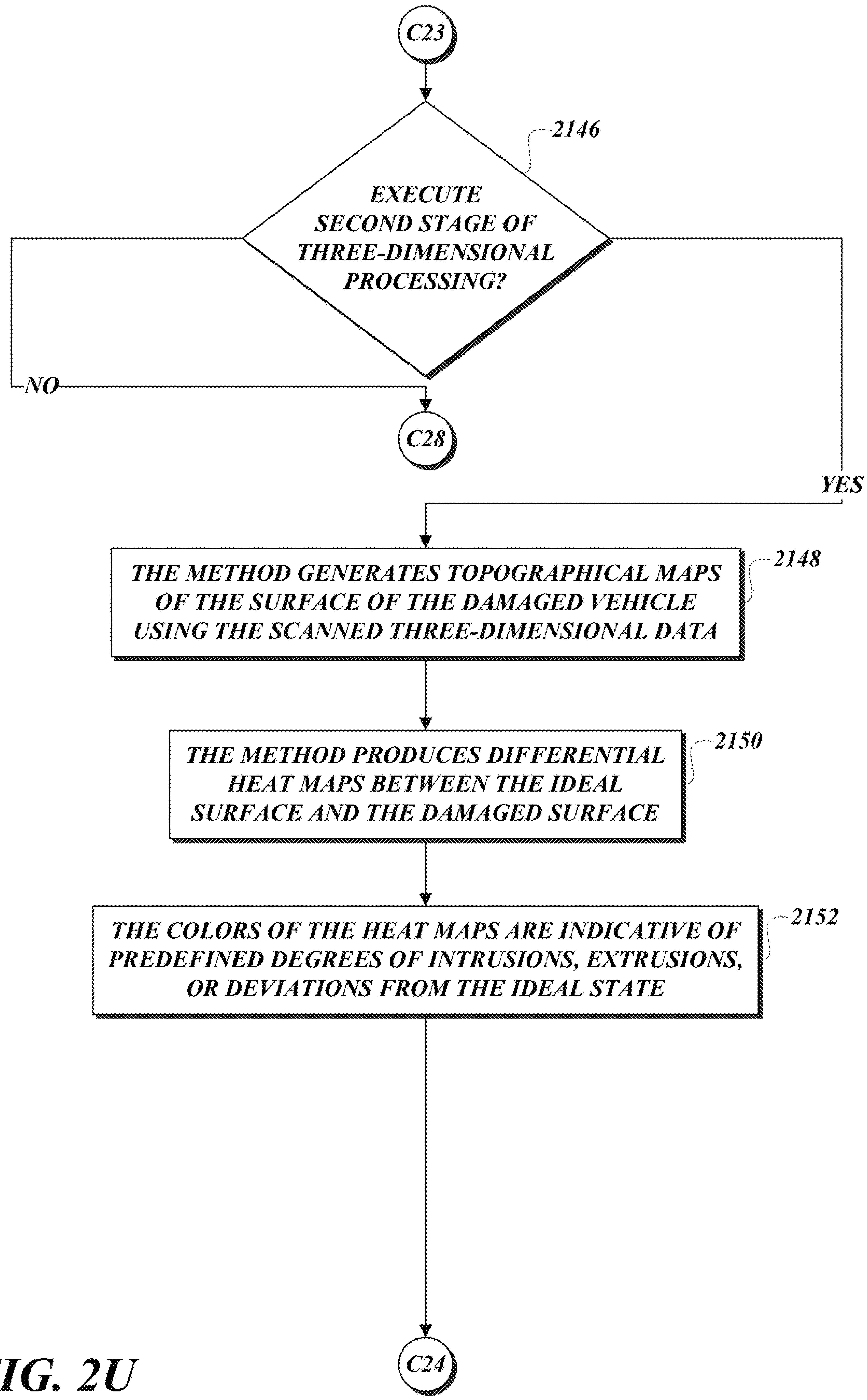

C23
2146
EXECUTE SECOND STAGE OF THREE-DIMENSIONAL PROCESSING?
NO
C28
YES
THE METHOD GENERATES TOPOGRAPHICAL MAPS OF THE SURFACE OF THE DAMAGED VEHICLE USING THE SCANNED THREE-DIMENSIONAL DATA
2148
THE METHOD PRODUCES DIFFERENTIAL HEAT MAPS BETWEEN THE IDEAL SURFACE AND THE DAMAGED SURFACE
2150
THE COLORS OF THE HEAT MAPS ARE INDICATIVE OF PREDEFINED DEGREES OF INTRUSIONS, EXTRUSIONS, OR DEVIATIONS FROM THE IDEAL STATE
2152
C24

FIG. 2U

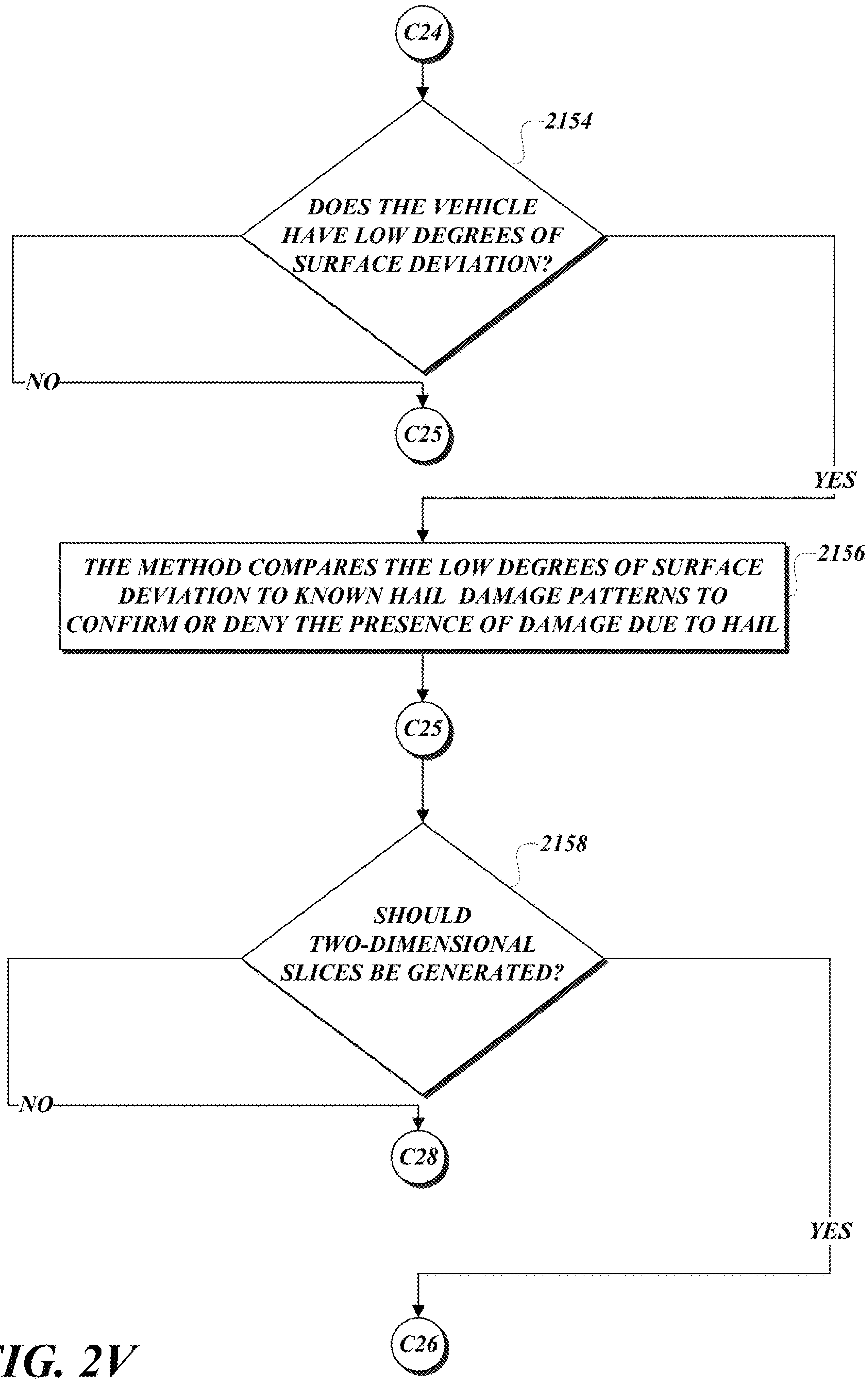

C24
2154
DOES THE VEHICLE HAVE LOW DEGREES OF SURFACE DEVIATION?
NO
C25
YES
THE METHOD COMPARES THE LOW DEGREES OF SURFACE DEVIATION TO KNOWN HAIL DAMAGE PATTERNS TO CONFIRM OR DENY THE PRESENCE OF DAMAGE DUE TO HAIL
2156
C25
2158
SHOULD TWO-DIMENSIONAL SLICES BE GENERATED?
NO
C28
YES
C26

FIG. 2V

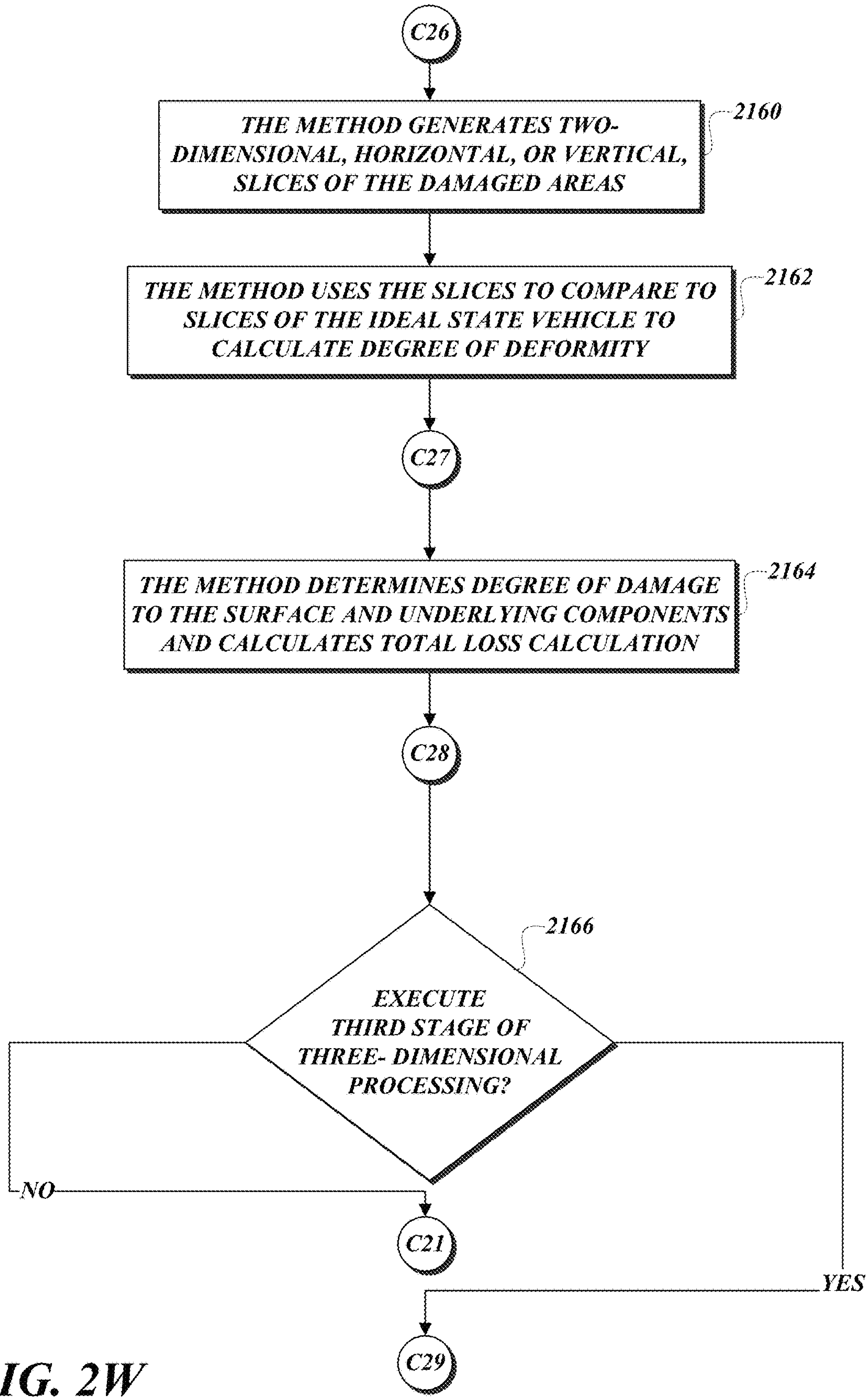

C26
THE METHOD GENERATES TWO-DIMENSIONAL, HORIZONTAL, OR VERTICAL, SLICES OF THE DAMAGED AREAS
2160
THE METHOD USES THE SLICES TO COMPARE TO SLICES OF THE IDEAL STATE VEHICLE TO CALCULATE DEGREE OF DEFORMITY
2162
C27
THE METHOD DETERMINES DEGREE OF DAMAGE TO THE SURFACE AND UNDERLYING COMPONENTS AND CALCULATES TOTAL LOSS CALCULATION
2164
C28
EXECUTE THIRD STAGE OF THREE- DIMENSIONAL PROCESSING?
2166
NO
C21
YES
C29

FIG. 2W

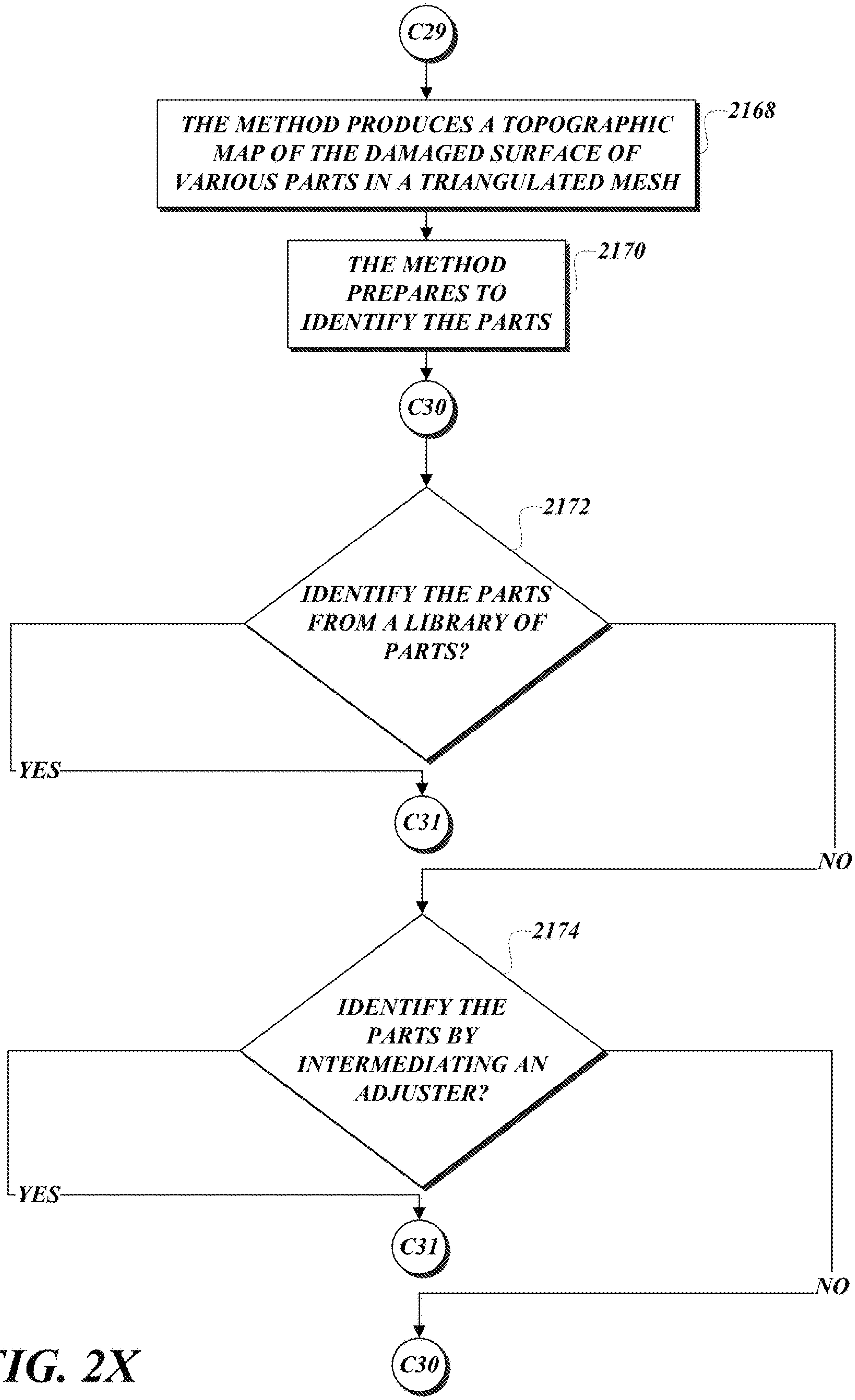

C29
THE METHOD PRODUCES A TOPOGRAPHIC MAP OF THE DAMAGED SURFACE OF VARIOUS PARTS IN A TRIANGULATED MESH
2168
THE METHOD PREPARES TO IDENTIFY THE PARTS
2170
C30
2172
IDENTIFY THE PARTS FROM A LIBRARY OF PARTS?
YES
C31
NO
2174
IDENTIFY THE PARTS BY INTERMEDIATING AN ADJUSTER?
YES
C31
NO
C30

FIG. 2X

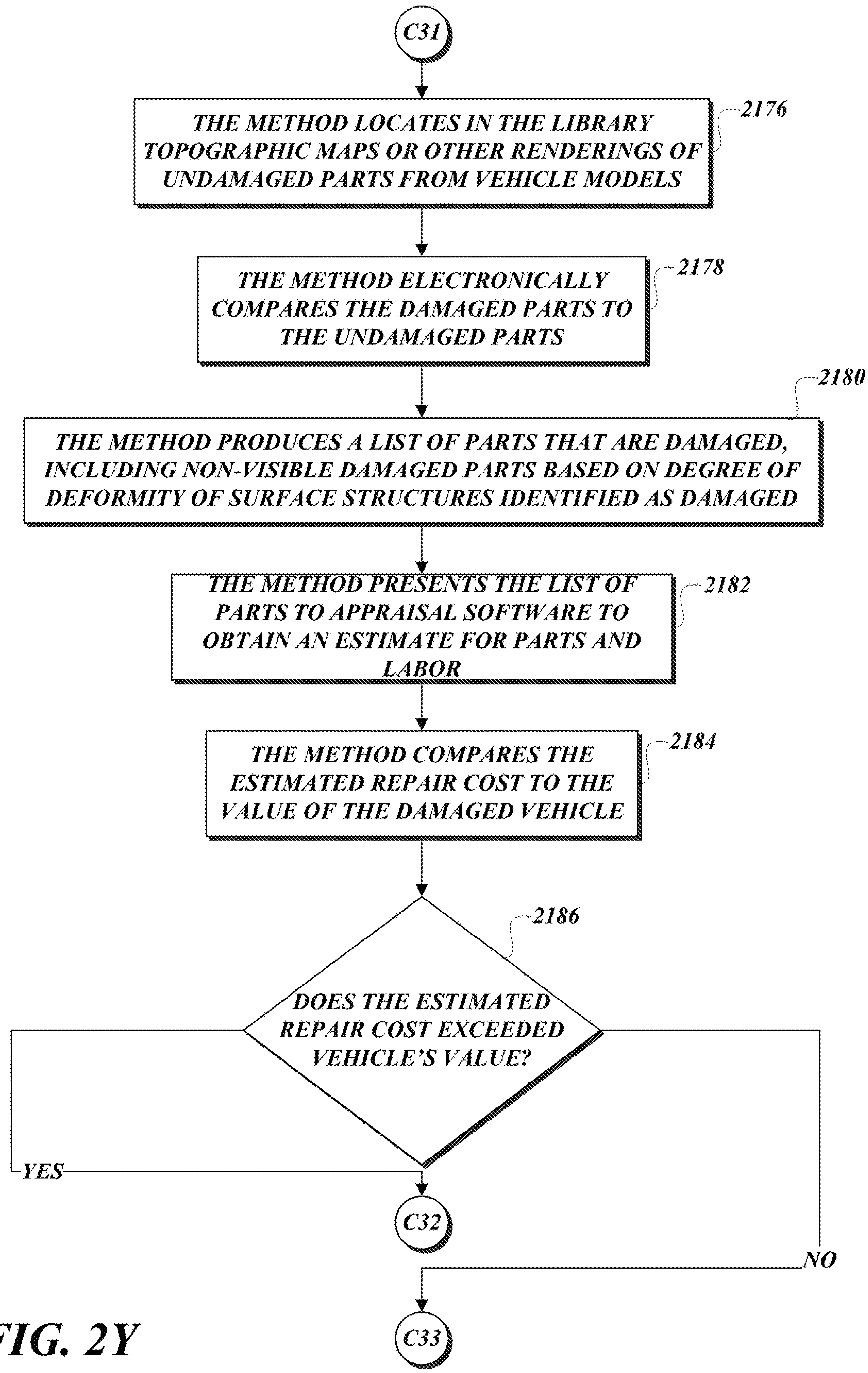

C31
THE METHOD LOCATES IN THE LIBRARY TOPOGRAPHIC MAPS OR OTHER RENDERINGS OF UNDAMAGED PARTS FROM VEHICLE MODELS
2176
THE METHOD ELECTRONICALLY COMPARES THE DAMAGED PARTS TO THE UNDAMAGED PARTS
2178
THE METHOD PRODUCES A LIST OF PARTS THAT ARE DAMAGED, INCLUDING NON-VISIBLE DAMAGED PARTS BASED ON DEGREE OF DEFORMITY OF SURFACE STRUCTURES IDENTIFIED AS DAMAGED
2180
THE METHOD PRESENTS THE LIST OF PARTS TO APPRAISAL SOFTWARE TO OBTAIN AN ESTIMATE FOR PARTS AND LABOR
2182
THE METHOD COMPARES THE ESTIMATED REPAIR COST TO THE VALUE OF THE DAMAGED VEHICLE
2184
DOES THE ESTIMATED REPAIR COST EXCEEDED VEHICLE'S VALUE?
2186
YES
NO
C32
C33

FIG. 2Y

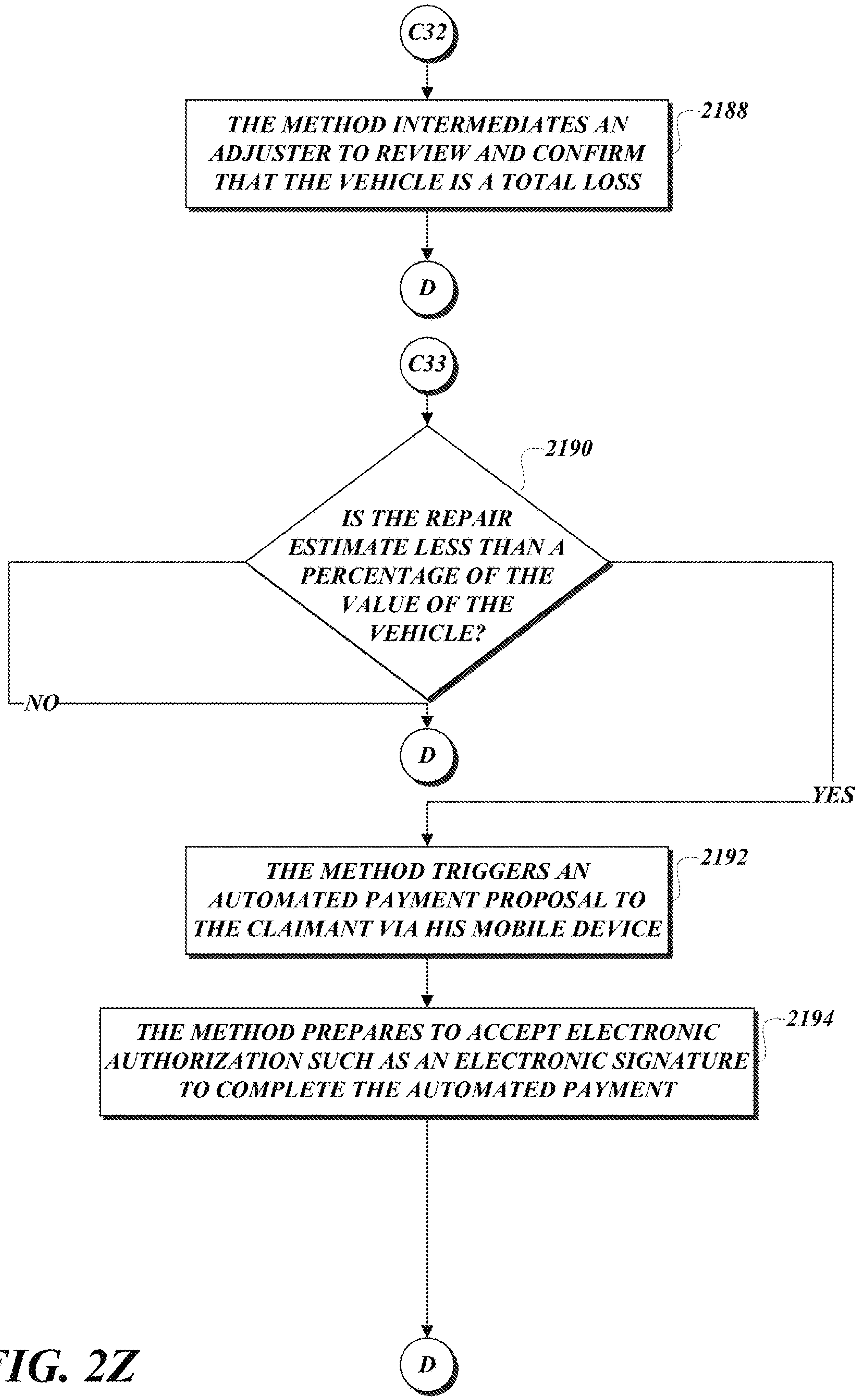

C32
THE METHOD INTERMEDIATES AN ADJUSTER TO REVIEW AND CONFIRM THAT THE VEHICLE IS A TOTAL LOSS
2188
D
C33
IS THE REPAIR ESTIMATE LESS THAN A PERCENTAGE OF THE VALUE OF THE VEHICLE?
2190
NO
D
YES
THE METHOD TRIGGERS AN AUTOMATED PAYMENT PROPOSAL TO THE CLAIMANT VIA HIS MOBILE DEVICE
2192
THE METHOD PREPARES TO ACCEPT ELECTRONIC AUTHORIZATION SUCH AS AN ELECTRONIC SIGNATURE TO COMPLETE THE AUTOMATED PAYMENT
2194
D

FIG. 2Z

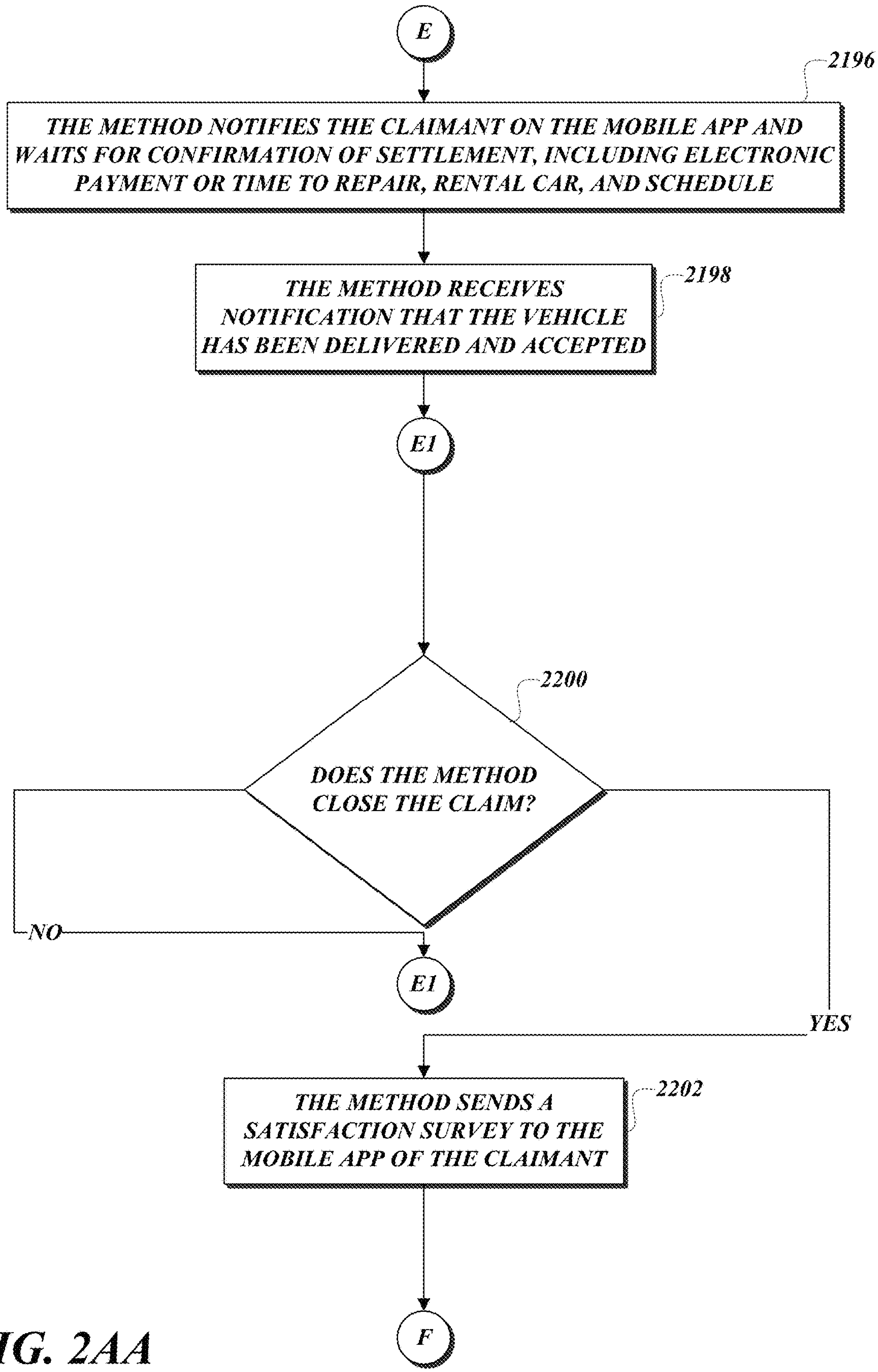

E
2196
THE METHOD NOTIFIES THE CLAIMANT ON THE MOBILE APP AND WAITS FOR CONFIRMATION OF SETTLEMENT, INCLUDING ELECTRONIC PAYMENT OR TIME TO REPAIR, RENTAL CAR, AND SCHEDULE
2198
THE METHOD RECEIVES NOTIFICATION THAT THE VEHICLE HAS BEEN DELIVERED AND ACCEPTED
E1
2200
DOES THE METHOD CLOSE THE CLAIM?
NO
E1
YES
2202
THE METHOD SENDS A SATISFACTION SURVEY TO THE MOBILE APP OF THE CLAIMANT
F

FIG. 2AA

VEHICLE DAMAGE ASSESSMENT USING 3D SCANNING

CROSS-REFERENCES TO RELATED APPLICATIONS

This application claims the benefit of U.S. Provisional Application Nos. 61/846,466, filed Jul. 15, 2013, and 61/939,447, filed Feb. 13, 2014, both of which are incorporated herein by reference.

TECHNICAL FIELD

The subject matter is generally related to claims processing, and more particularly, it relates to automated claims adjustment using three-dimensional patterns.

BACKGROUND

Insurance company claims departments employ a large number of claims adjusters supported by a staff of records management and data entry clerks. Incoming claims are classified based on severity and are assigned to adjusters whose settlement authority varies with their knowledge and experience. The adjuster undertakes an investigation of each claim, usually in close cooperation with the claimant, determines if coverage is available under the terms of the insurance contract, and if so, the reasonable monetary value of the claim, and authorizes payment. Because it is labor intensive, high costs are associated with the manual claims process using human beings and the delays and/or inconsistencies that can arise from human judgment, especially when claims adjusters have varying levels of experience.

SUMMARY

This summary is provided to introduce a selection of concepts in a simplified form that are further described below in the Detailed Description. This summary is not intended to identify key features of the claimed subject matter, nor is it intended to be used as an aid in determining the scope of the claimed subject matter.

One aspect of the subject matter includes a system form which recites a system comprising capture hardware, the structure of which is suitable for capturing telematics and structured-light data by scanning a damaged vehicle and placing data into a virtual file. The system also comprises claim estimate hardware, the structure of which is capable of estimating a claim estimate based on the captured pictorial data of the damaged vehicle and the telematics. The system further comprises settle claim hardware, the structure of which has a capacity to present the claim estimate to a claimant on his mobile device. Electronic acceptance of the claim estimate causes the settle claim hardware to settle a claim.

Another aspect of the subject matter includes a method form which recites a method comprising capturing three-dimensional data of a damaged vehicle including its telematics; opening a claim electronically and notifying a claimant on his mobile device; validating the data to decide whether to proceed with automated claims adjustment; automatically adjusting to form a claim estimate based on the data and the telematics; settling by presenting the claim estimate to the claimant on his mobile device; and closing the claim if the claimant electronically accepts the claim estimate.

An additional aspect of the subject matter includes another method form which recites a method comprising projecting light pattern on a damaged vehicle to reveal deformation of the pattern; offsetting from the light pattern, obtaining a shape of the pattern by a camera; calculating, from the shape, distance of every point in the field of view; and determining using structured-light calculation contours of the damaged vehicle.

Another aspect of the subject matter includes a computer-readable medium form which recites a computer-readable medium, which is non-transitory, having computer-executable instructions stored thereon to implement a method comprising capturing three-dimensional data of a damaged vehicle including its telematics; opening a claim electronically and notifying a claimant on his mobile device; validating the data to decide whether to proceed with automated claims adjustment; automatically adjusting to form a claim estimate based on the data and the telematics; settling by presenting the claim estimate to the claimant on his mobile device; and closing the claim if the claimant electronically accepts the claim estimate.

DESCRIPTION OF THE DRAWINGS

The foregoing aspects and many of the attendant advantages of this invention will become more readily appreciated as the same become better understood by reference to the following detailed description, when taken in conjunction with the accompanying drawings, wherein:

FIG. **1** is a block diagram illustrating an archetypical system with pieces of hardware; and

FIGS. **2**A-**2**AA are process diagrams implementing an archetypical method for facilitating automated claims adjustments.

DETAILED DESCRIPTION

Various embodiments are engineered to facilitate automated claims adjustment. FIG. **1** illustrates a system **100** comprising five sub-systems that implement an automated claims adjustment system. These sub-systems have hardware structures which are suitable for receiving submission of two-dimensional data (such as photographs), three-dimensional data (such as scanned structured-light data), and other pieces of information directly via a mobile device. Upon receiving sufficient information to open a claim, the sub-systems cause the automated claims adjustment and settlement process to be executed, aiding and guiding a claimant. These sub-systems also reduce the time involved by the claimant in waiting for a claims adjuster to manually review a specific case file. The system **100** takes claims and provides resolution, allowing experienced human claims adjusters to spend their time and effort on the complex cases.

More specifically, many embodiments are engineered to reduce or eliminate the need for an experienced adjustor to personally inspect a damaged vehicle, thus increasing a claims adjuster's productivity by taking him out of the field and placing him in an oversight or review role when he is electronically intermediated. The embodiments automate and make the damage assessment and claims adjustment process more efficient and decrease the time required between assessment and payment. In some embodiments, the damage assessment and appraisal process are more accurate.

Some embodiments are engineered to use artificial intelligence emulating the knowledge and reasoning of an experienced claims adjuster so as to increase efficiency by allowing appraisals to be performed by no one or by a less knowledgeable person, thus reducing the need for the claims adjuster to be in the field and increasing the number of appraisals that he can oversee in a day. The embodiments are engineered to enhance or speed the appraisal process by identifying for the claims adjuster the damaged areas, including surface and substructures, prepopulating this information in appraisal software, and in some cases, selectively or automatically completing the appraisal process without review and generating a repair cost and time estimate.

The system **100** illustrates a scene of an accident **102** involving at least a damaged vehicle of one or more claimants **104**. Using a mobile app downloadable from the system **100**, the claimants **104** may use capture hardware **106**, the hardware structure of which is suitable for capturing two-dimensional data or three-dimensional data of the damaged vehicle at the accident **102**. In one embodiment, the capture hardware **106** includes a camera on a mobile device, the hardware of which is capable of capturing two-dimensional data, such as images or photographs.

In embodiments in which the capture hardware **106** captures three-dimensional data, the capture hardware **106** has hardware, the structure of which is suitable for three-dimensional scanning which performs multiple scans of the accident **102** including one or more damaged vehicles. In a few embodiments, the capture hardware **106** is suitable to perform structured-light scanning to project a pattern of light on a vehicle and reveal the deformation of the pattern on the vehicle. The pattern is projected onto the vehicle using either an LCD projector or other stable light source. A camera, offset slightly from the pattern projector, looks at the shape of the pattern and calculates the distance of every point in the field of view.

If the capture hardware **106** is an active device, the same structure is suitable for sending, receiving, and storing information via telecommunication. The same structure suitably has a radiation emitter. The same structure suitably has a light detector. If the capture hardware **106** is a passive device, the system **100** presents resultant passive data taken from a camera on a mobile device to a passive data database (on the mobile device or in the cloud) where these pieces of passive data are stored. Otherwise, if the resultant data is a point cloud, the system **100** presents the point cloud produced by the capture hardware **106** to a point cloud database (on the mobile device or in the cloud) where it is stored. Alignment software receives either information from the passive data database or the point cloud from the point cloud database. The alignment software is capable of aligning multiple scans to a common reference system. The alignment software then presents the registered or aligned multiple scans to reconstruction software which has the capacity to reconstruct the scene of the accident **102** including one or more damaged vehicles. This reconstruction, especially the reconstruction of the damaged vehicles, forms a part of a virtual file, the electronic records of which are used for insurance services.

In embodiments in which the capture hardware **106** captures three-dimensional data, the capture hardware **106** is a device that analyzes a real-world accident and vehicles involved to collect data on their shape and/or their appearance, including color. The collected data can then be used to construct a digital three-dimensional model of the vehicles. In some embodiments, the capture hardware **106** creates a point cloud of geometric samples on the surface of the vehicles. These cloud points can then be used to extrapolate the shape of the vehicles, which in the idiom is called reconstruction. In other embodiments, the capture hardware **106** is a passive device. Passive capture hardware **106** does not emit radiation, but instead relies on detecting reflected ambient radiation which includes visible light, although infrared could suitably be used. Each piece of the capture hardware **106** has camera-like hardware having a cone-like field of view to facilitate collection of distance information about surfaces of a vehicle. The three-dimensional data captured by the capture hardware **106** describes the distance to a surface at each point of the vehicle. In some embodiments, a single scan will not produce a complete model of the vehicle. Multiple scans, from different directions, facilitate information about all sides of the vehicle. These scans are suitably brought into a common reference system by the system **100**, after which they are merged by the reconstruction software for automated claims adjustment.

The data captured by the capture hardware **106** is then forwarded to an open claim hardware **108**, the hardware structure of which is capable of opening an insurance claim to investigate the extent of the damage to the damaged vehicles and the accident **102**. The open claim hardware **108** presents a claim to full data validation hardware **114**, the hardware structure of which has the capacity to validate data in the virtual file obtained by the open claim hardware **108** to determine whether or not automated claims adjustment is suitable. If the full data validation hardware **114** determines that the virtual file connected with the claim qualifies for automated claims adjustment, the virtual file is presented to compare hardware **116**.

The compare hardware **116** has a hardware structure that is suitable for comparing the damaged vehicle and an ideal vehicle (with no damage) to determine the extent of the damage. The comparison results are then presented to augment data hardware **118**, the hardware structure of which is capable of augmenting the extent of the damage with information from telematics and in-vehicle sensors. The system **100** then actuates damage estimate hardware **120**, the hardware structure of which has the capacity to calculate estimates from a list of visible parts and non-visible parts, labor, and other costs connected with the damage. The estimate hardware **120** is suitable to interface with a vehicle appraisal software to generate a repair estimate. A claim estimate hardware **122** has a hardware structure which has a capacity to compute the total estimate connected with the claim. The claim estimate is then presented to settle claim hardware **110**, the hardware structure of which is capable of presenting information to the claimant **104** via the mobile app on his mobile device. The settle claim hardware **110** may iterate with the claimant **104** to pick a repair schedule and terms of repairs that are acceptable to the claimant **104**. After the claimant **104** accepts the settlement and/or delivery of his repaired vehicle, close claim hardware **112** presents options to the claimant **104** to intermediate a claims adjuster or it closes the claim.

FIGS. **2**A-**2**AA are process diagrams implementing an exemplary method **2000** for facilitating automated claims adjustments. From the start block, the method **2000** proceeds to a set of method steps **2002** defined between a continuation terminal ("terminal A") and another continuation terminal ("terminal B"). The set of method steps **2002** prepares to open a claim electronically. From terminal A (FIG. **2**A), the method **2000** proceeds to decision block **2008** where a test is performed to determine whether a mobile device of the claimant has a mobile app to facilitate automated claims adjustment installed on it. If the answer to the test at decision block **2008** is YES, the method proceeds to another continuation terminal ("terminal **A1**"). Otherwise, if the answer to the test at decision block **2008** is NO, the method proceeds to block **2010** where the method downloads the mobile app to the mobile device. The method then continues to terminal A**1**. From terminal A**1** (FIG. **2**B), the method **2000** proceeds to decision block **2012** where a test is performed to determine whether three-dimensional claim data capturing is selected. If the answer to the test at decision block **2012** is YES, the method proceeds to another continuation terminal ("terminal A**3**"). Otherwise, if the answer to the test at decision block **2012** is NO, the method proceeds to another continuation terminal ("terminal A**2**").

From terminal A**2** (FIG. **2**C), the method proceeds to decision block **2014** where a test is performed to determine whether the image capturing device is turned on. If the answer to the test at decision block **2014** is NO, the method proceeds to terminal A**2** and skips back to previously discussed processing steps. Otherwise, if the answer to the test at decision block **2014** is YES, the method proceeds to block **2016** where the mobile app interactively guides the claimant in taking pictures of the damage, preferably at the scene of the accident. The method then continues to another continuation terminal ("terminal A**4**"). From terminal A**3** (FIG. **2**C), the method **2000** proceeds to block **2018** where the mobile app interactively guides the claimant in taking three-dimensional data of the damage by scanning. The method negates the need for position reference points to be placed on the surface to be scanned. The method facilitates the ability to measure deformities down to 1 mm using structured-light scanning. In many embodiments, the method need not use photographs as the definitive source for determining the extent of damage. In some embodiments, the three-dimensional data facilitates measurement of damage that is not readily discernible through photographs, such as light colored vehicles or vehicles with low degrees of surface deviation (hail damage). The method then continues to terminal A**4**. From terminal A**4** (FIG. **2**C), the method **2000** proceeds to block **2020** where the mobile app further guides the claimant in capturing other claim data, including names, addresses, car data, color, accident location, telematics, weather, insurance policy, and so on. The method then continues to another continuation terminal ("terminal A**5**").

From terminal A**5** (FIG. **2**D), the method proceeds to decision block **2022** where a test is performed to determine whether the method received instructions to open a claim. If the answer to the test at decision block **2022** is NO, the method proceeds to terminal A**5** and skips back to previously discussed processing steps. Otherwise, if the answer to the test at decision block **2022** is YES, the method proceeds to block **2024** where the method receives pictorial information, two-dimensionally or three-dimensionally, of the damage. At block **2026**, the method receives information regarding the scene context including damage information pertaining to the other vehicle or property. At block **2028**, the method also receives from the mobile app the date/time, geo tag information, and the telematics data. At block **2030**, the method verifies the data to decide whether to proceed with an automated claim adjustment or require additional data or to intermediate a claim representative. At block **2032**, the method opens a claim and notifies the claimant on his mobile device through the mobile app regarding claim information. The method then continues to terminal B.

From terminal B (FIG. **2**A), the method **2000** proceeds to a set of method steps **2004** defined between a continuation terminal ("terminal C") and another continuation terminal ("terminal D"). The set of method steps **2004** electronically performs automated adjustments. From terminal C (FIG. **2**E), the method **2000** proceeds to decision block **2034** where a test is performed to determine whether there are instructions for automated adjustment of the claim. If the answer to the test at decision block **2034** is NO, the method proceeds to another continuation terminal ("terminal C**1**"). Otherwise, if the answer to the test at decision block **2034** is YES, the method proceeds to decision block **2036** where a test is performed to determine whether the pictorial information is two-dimensional. If the answer to the test at decision block **2036** is NO, the method proceeds to another continuation terminal ("terminal C**21**"). Otherwise, if the answer to the test at decision block **2036** is YES, the method proceeds to block **2038** where the method prepares to execute the first stage of automated adjustment. At block **2040**, the method processes the two-dimensional pictorial information (photographs or images). The method then continues to another continuation terminal ("terminal C**4**").

From terminal C**1** (FIG. **2**F), the method proceeds to decision block **2042** where a test is performed to determine whether the method requires additional data. If the answer to the test at decision block **2042** is NO, the method proceeds to another continuation terminal ("terminal C**2**"). Otherwise, if the answer to the test at decision block **2042** is YES, the method proceeds to block **2044** where the method causes the mobile app to guide the claimant to obtain additional data. The method then continues to terminal C and skips back to previously discussed processing steps. From terminal C**2** (FIG. **2**F), the method proceeds to decision block **2046** where a test is performed to determine whether a claims adjuster is electronically intermediated. If the answer to the test at decision block **2046** is NO, the method proceeds to terminal C and skips back to previously discussed processing steps. Otherwise, if the answer to the test at decision block **2046** is YES, the method proceeds to another continuation terminal ("terminal C**3**").

From terminal C**3** (FIG. **2**G), the method proceeds to block **2048** where the method electronically intermediates a claims adjuster on the mobile app to interact with the claimant. The method then continues to terminal C and skips back to previously discussed processing steps. From terminal C**4** (FIG. **2**G), the method proceeds to block **2050** where the method compares the received two-dimensional images with images in a database of undamaged portions of an undamaged vehicle. The method then proceeds to decision block **2052** where a test is performed to determine whether the extent of damage can be determined. If the answer to the test at decision block **2052** is NO, the method proceeds to terminal C**1** and skips back to previously discussed processing steps. Otherwise, if the answer to the test at decision block **2052** is YES, the method proceeds to block **2054** where the method uses claim information, including make/model of the vehicle and telematics data to prepare to calculate a full estimate. The method then continues to another continuation terminal ("terminal C**5**").

From terminal C**5** (FIG. **2**H), the method proceeds to block **2056** where the method calculates the full estimate using a parts database to extract parts and labor. At block **2058**, the method derives the number of days for a rental vehicle from the time and policy of the claimant and refines the full estimate. At block **2060**, the method automatically checks the schedules for availability of repair facilities for repairing the vehicle of the claimant. The method then continues to decision block **2062** where a test is performed to determine whether the second stage of automated adjustment should be executed. If the answer to the test at decision block **2062** is YES, the method proceeds to another continuation terminal ("terminal C**7**"). Otherwise, if the answer to the test at decision block **2062** is NO, the method proceeds to block **2064** where the method communicates the full estimate. The method then continues to another continuation terminal ("terminal C**6**").

From terminal C**6** (FIG. **2**I), the method proceeds to decision block **2066** where a test is performed to determine whether the confirmation of the full estimate is received. If the answer to the test at decision block **2066** is NO, the method proceeds to terminal C**6** and skips back to previously discussed processing steps. Otherwise, if the answer to the test at decision block **2066** is YES, the method proceeds to block **2068** where the method automatically schedules a repair facility that is available, automatically orders parts, and so on. The method then continues to terminal D. From terminal C**7** (FIG. **2**I), the method proceeds to block **2070** where the method receives a virtual file from the mobile app containing data to run automated claims adjustment software. At block **2072**, the method runs tests to validate and verify the virtual file to determine whether automated claims adjustment can be executed. The method then continues to another continuation terminal ("terminal C**8**").

From terminal C**8** (FIG. **2**J), the method proceeds to decision block **2074** where a test is performed to determine whether image quality is sufficient to proceed. If the answer to the test at decision block **2074** is NO, the method proceeds to terminal C**1** and skips back to previously discussed processing steps. Otherwise, if the answer to the test at decision block **2074** is YES, the method proceeds to decision block **2076** where a test is performed to determine whether the date/time of the content of the virtual file is valid. If the answer to the test at decision block **2076** is NO, the method proceeds to terminal C**1** and skips back to previously discussed processing steps. Otherwise, if the answer to the test at decision block **2076** is YES, the method proceeds to another continuation terminal ("terminal C**9**").

From terminal C**9** (FIG. **2**K), the method proceeds to decision block **2078** where a test is performed to determine whether telematics data is valid. If the answer to the test at decision block **2078** is NO, the method proceeds to terminal C**1** and skips back to previously discussed processing steps. Otherwise, if the answer to the test at decision block **2078** is YES, the method proceeds to decision block **2080** where a test is performed to determine whether other information submitted by the claimant is valid. If the answer to the test at decision block **2080** is NO, the method proceeds to terminal C**1** and skips back to previously discussed processing steps. Otherwise, if the answer to the test at decision block **2080** is YES, the method proceeds to another continuation terminal ("terminal C**10**").

From terminal C**10** (FIG. **2**L), the method proceeds to decision block **2082** where a test is performed to determine whether additional data is needed. If the answer to the test at decision block **2082** is YES, the method proceeds to terminal C**1** and skips back to previously discussed processing steps. Otherwise, if the answer to the test at decision block **2082** is NO, the method proceeds to decision block **2084** where a test is performed to determine whether the data needs to be re-transmitted. If the answer to the test at decision block **2084** is YES, the method proceeds to terminal C**1** and skips back to previously discussed processing steps. Otherwise, if the answer to the test at decision block **2084** is NO, the method proceeds to another continuation terminal ("terminal C**11**").

From terminal C**11** (FIG. **2**M), the method proceeds to decision block **2086** where a test is performed to determine whether the nature of the data requires intermediation. If the answer to the test at decision block **2086** is YES, the method proceeds to terminal C**3** and skips back to previously discussed processing steps. Otherwise, if the answer to the test at decision block **2086** is NO, the method proceeds to decision block **2088** where a test is performed to determine whether the severity of the damage requires intermediation. If the answer to the test at decision block **2088** is YES, the method proceeds to terminal C**3** and skips back to previously discussed processing steps. Otherwise, if the answer to the test at decision block **2088** is NO, the method proceeds to another continuation terminal ("terminal C**12**").

From terminal C**12** (FIG. **2**N), the method proceeds to decision block **2090** where a test is performed to determine whether the claimant is unresponsive. If the answer to the test at decision block **2090** is YES, the method proceeds to terminal C**3** and skips back to previously discussed processing steps. Otherwise, if the answer to the test at decision block **2090** is NO, the method proceeds to block **2092** where the method identifies a model vehicle from an online catalog of supported vehicles and retrieves images from a database of undamaged parts of an undamaged vehicle. The method then continues to another continuation terminal ("terminal C**13**"). From terminal C**13** (FIG. **2**N), the method proceeds to block **2094** where the method performs image compare and executes matching software. The method then continues to decision block **2096** where a test is performed to determine whether the method can only make a partial match. If the answer to the test at decision block **2096** is YES, the method proceeds to another continuation terminal ("terminal C**14**"). Otherwise, if the answer to the test at decision block **2096** is NO, the method proceeds to another continuation terminal ("terminal C**16**").

From terminal C**14** (FIG. **2**O), the method proceeds to decision block **2098** where a test is performed to determine whether more images are required from the claimant. If the answer to the test at decision block **2098** is YES, the method proceeds to terminal C**1** and skips back to previously discussed processing steps. Otherwise, if the answer to the test at decision block **2098** is NO, the method proceeds to decision block **2100** where a test is performed to determine whether a claim adjuster should be involved. If the answer to the test at decision block **2100** is YES, the method proceeds to terminal C**3** and skips back to previously discussed processing steps. Otherwise, if the answer to the test at decision block **2100** is NO, the method proceeds to another continuation terminal ("terminal C**15**").

From terminal C**15** (FIG. **2**P), the method proceeds to decision block **2102** where a test is performed to determine whether the vehicle is already at a repair facility. If the answer to the test at decision block **2102** is NO, the method proceeds to another continuation terminal ("terminal F"). Otherwise, if the answer to the test at decision block **2102** is YES, the method proceeds to block **2104** where the method accesses the system at the repair facility to obtain data for further automated adjustment. The method then continues to another continuation terminal ("terminal C**16**"). From terminal C**16** (FIG. **2**P), the method proceeds to block **2106** where the method obtains telematics data in the virtual file and augments the virtual file to effect the estimating process. The method then continues to block **2108** where the method obtains in-vehicle sensor data, including force of impact, direction of impact, and so on, to augment the estimating process. At block **2110**, the method uses the augmentation of data to identify non-visible parts that need repair replacement, or further inspection. The method then continues to another continuation terminal ("terminal C**17**").

From terminal C**17** (FIG. **2**Q), the method proceeds to block **2112** where the method prepares to estimate the damage. At block **2114**, the method compiles a list of parts as a function of vehicle part lists, repair decompositions, and derived non-visible damage to parts from telematics and in-vehicle sensors. At block **2116**, based on the list of parts (bill of materials or BOM), the method calculates the labor associated with repair, replacement, and/or inspection. At block **2118**, the method estimates the damage. The method then continues to another continuation terminal ("terminal C**18**"). At terminal C**18** (FIG. **2**Q), the method proceeds to block **2120** where the method prepares to estimate the claim. At block **2122**, the method estimates time, effort, and costs as functions of parts list, labor estimates, and damage estimates. At block **2124**, the method scores a repair facility or a repair bid based on the BOM, labor estimates, time for parts availability, time for repair, and so on. The method then continues to another continuation terminal ("terminal C**19**").

From terminal C**19** (FIG. **2**R), the method proceeds to decision block **2126** where a test is performed to determine whether to source the work to an identified repair facility. If the answer to the test at decision block **2126** is YES, the method proceeds to another continuation terminal ("terminal C**20**"). Otherwise, if the answer to the test at decision block **2126** is NO, the method proceeds to decision block **2128** where a test is performed to determine whether to source the work to a real-time bid process. If the answer to the test at decision block **2128** is YES, the method proceeds to terminal C**20**. Otherwise, if the answer to the test at decision block **2128** is NO, the method proceeds to terminal C**19** and skips back to previously discussed processing steps. From terminal C**20** (FIG. **2**R), the method proceeds to block **2130** where the method locks in estimates and the service level agreement regarding completion times and quality of work. The method then continues to terminal D.

From terminal C**21** (FIG. **2**S), the method **2000** proceeds to decision block **2132** where a test is performed to determine whether the pictorial information is three dimensional. If the answer to the test at decision block **2132** is NO, the method proceeds to terminal C and skips back to previously discussed processing steps. Otherwise, if the answer to the test at decision block **2132** is YES, the method proceeds to decision block **2134** where a test is performed to determine whether to execute the first state of three-dimensional processing. If the answer to the test at decision block **2134** is NO, the method proceeds to another continuation terminal ("terminal C**23**"). Otherwise, if the answer to the test at decision block **2134** is YES, the method proceeds to block **2136** where the method accesses the virtual file to obtain captured contours of the damaged vehicle. At block **2138**, the method creates a topographic model of the damaged areas of the damaged vehicle. The method then continues to another continuation terminal ("terminal C**22**").

From terminal C**22** (FIG. **2**T), the method proceeds to block **2140** where the method analyzes a level to which the captured contours do not conform to the undamaged state to determine extent of damage. At block **2142**, the method refines the extent of damage by comparing the damaged state to a three-dimensional model of the undamaged state so as to find any damage to surfaces or sub-structures. At block **2143**, the method generates a list of affected parts, time to repair, and estimates to repair without using two-dimensional photos. The method then continues to decision block **2144** where a test is performed to determine whether to allow immediate payment of estimates to the claimant. If the answer to the test at decision block **2144** is YES, the method proceeds to terminal D. Otherwise, if the answer to the test at decision block **2144** is NO, the method proceeds to another continuation terminal ("terminal C**23**").

From terminal C**23** (FIG. **2**U), the method proceeds to decision block **2146** where a test is performed to determine whether to execute the second stage of three-dimensional processing. If the answer to the test at decision block **2146** is NO, the method continues to another continuation terminal ("terminal C**28**"). Otherwise, if the answer to the test at decision block **2146** is YES, the method proceeds to block **2148** where the method generates topographical maps of the surface of the damaged vehicle using the scanned three-dimensional data. At block **2150**, the method produces differential heat maps between the ideal surface and the damaged surface. At block **2152**, the colors of the heat maps are indicative of predefined degrees or intrusions, extrusions, or deviations from the ideal state. The method then continues to another continuation terminal ("terminal C**24**").

From terminal C**24** (FIG. **2**V), the method proceeds to decision block **2154** where a test is performed to determine whether the vehicle has low degrees of surface deviation. If the answer to the test at decision block **2154** is NO, the method proceeds to another continuation terminal ("terminal C**25**"). Otherwise, if the answer to the test at decision block **2154** is YES, the method proceeds to block **2156** where the method compares the low degrees of surface deviation to known hail damage patterns to confirm or deny the presence of damage due to hail. The method then continues to terminal C**25**. From terminal C**25** (FIG. **2**V), the method proceeds to decision block **2158** where a test is performed to determine whether two-dimensional slices should be generated. If the answer to the test at decision block **2158** is NO, the method proceeds to another continuation terminal ("terminal C**28**"). Otherwise, if the answer to the test at decision block **2158** is YES, the method proceeds to another continuation terminal ("terminal C**26**").

From terminal C**26** (FIG. **2**W), the method proceeds to block **2160** where the method generates two-dimensional, horizontal or vertical slices of the damaged areas. At block **2162**, the method uses the slices to compare to slices of the ideal state vehicle to calculate the degree of deformity. The method then continues to another continuation terminal ("terminal C**27**"). From terminal C**27** (FIG. **2**W), the method proceeds to block **2164** where the method determines the degree of damage to the surface and underlying components and performs a total loss calculation. The method then continues to terminal C**28**. From terminal C**28** (FIG. **2**W), the method proceeds to decision block **2166** where a test is performed to determine whether to execute the third stage of three-dimensional processing. If the answer to the test at decision block **2166** is NO, the method proceeds to terminal C**21** and skips back to previously discussed processing steps. Otherwise, if the answer to the test at decision block **2166** is YES, the method proceeds to another continuation terminal ("terminal C**29**").

From terminal C**29** (FIG. **2**X), the method proceeds to block **2168** where the method produces a topographic map of the damaged surfaces of various parts in a triangulated mesh. At block **2170**, the method prepares to identify the parts. The method then continues to another continuation terminal ("terminal C**30**"). From terminal C**30** (FIG. **2**X), the method proceeds to decision block **2172** where a test is performed to determine whether to identify the parts from a library of parts. If the answer to the test at decision block **2172** is YES, the method then continues to another continuation terminal ("terminal C**31**"). Otherwise, if the answer to the test at decision block **2172** is NO, the method proceeds to decision block **2174** where a test is performed to determine whether to identify the parts by intermediating an adjuster. If the answer to the test at decision block **2174** is

YES, the method proceeds to terminal C**31**. Otherwise, if the answer to the test at decision block **2174** is NO, the method proceeds to terminal C**30** and skips back to previously discussed processing steps.

From terminal C**31** (FIG. **2**Y), the method proceeds to block **2176** where the method locates in the library topographic maps or other renderings of undamaged parts from vehicle models. At block **2178**, the method electronically compares the damaged parts to the undamaged parts. At block **2180**, the method produces a list of parts that are damaged, including non-visible damaged parts based on the degree of deformity of surface structures identified as damaged. At block **2182**, the method presents the list of parts to appraisal software to obtain an estimate for parts and labor. At block **2184**, the method compares the estimated repair cost to the value of the damaged vehicle. The method then continues to decision block **2186** where a test is performed to determine whether the estimated repair cost exceeds the vehicle's value. If the answer to the test at decision block **2186** is YES, the method proceeds to another continuation terminal ("terminal C**32**"). Otherwise, if the answer to the test at decision block **2186** is NO, the method proceeds to another continuation terminal ("terminal C**33**").

From terminal C**32** (FIG. **2**Z), the method proceeds to block **2188** where the method intermediates an adjuster (human) to review and confirm that the vehicle is a total loss. The method then continues to terminal D. From terminal C**33** (FIG. **2**Z), the method **2000** proceeds to decision block **2190** where a test is performed to determine whether the repair estimate is less than a percentage of the value of the vehicle. If the answer to the test at decision block **2190** is NO, the method proceeds to terminal D. Otherwise, if the answer to the test at decision block **2190** is YES, the method proceeds to block **2192** where the method triggers an automated payment proposal to the claimant via his mobile device. At block **2194**, the method prepares to accept electronic authorization, such as an electronic signature, to complete the automated payment. The method then continues to terminal D.

From terminal D (FIG. **2**A), the method **2000** proceeds to a set of method steps **2006** defined between a continuation terminal ("terminal E") and another continuation terminal ("terminal F"). The set of method steps **2006** prepares to settle the claim and closes the claim. From terminal E (FIG. **2**AA), the method proceeds to block **2196** where the method notifies the claimant on the mobile app and waits for confirmation of settlement, including electronic payment or time to repair, rental car, and schedule. At block **2198**, the method receives notification that the vehicle has been delivered and accepted. The method then continues to another continuation terminal ("terminal E**1**"). From terminal E**1** (FIG. **2**AA), the method proceeds to decision block **2200** where a test is performed to determine whether the method closes the claim. If the answer to the test at decision block **2200** is NO, the method proceeds to terminal E**1** and skips back to previously discussed processing steps. Otherwise, if the answer to the test at decision block **2200** is YES, the method proceeds to block **2202** where the method sends a satisfaction survey to the mobile app of the claimant and closes the claim. The method then continues to terminal F and terminates execution.

While illustrative embodiments have been illustrated and described, it will be appreciated that various changes can be made therein without departing from the spirit and scope of the invention.

The embodiments of the invention in which an exclusive property or privilege is claimed are defined as follows:

1. A method comprising:

projecting light pattern on a damaged vehicle to reveal deformation of the pattern;

offsetting from the light pattern, obtaining a shape of the pattern by a camera;

calculating, from the shape, distance of every point in the field of view;

determining using structured-light calculation contours of the damaged vehicle; and

creating differential heat maps to detect degrees of intrusion, extrusion, or deviation from the undamaged vehicle.

2. The method of claim **1**, further comprising creating a topographic model of the damaged vehicle so as to compare the damaged vehicle to a three-dimensional model of an undamaged vehicle to determine extent of the damage to surface and sub-structures.

3. The method of claim **1**, further comprising immediate electronic payment of a claim estimate to a claimant based on the extent of the damage.

4. The method of claim **1**, wherein determining occurs without using photographic images to determine the extent of the damage.

5. The method of claim **1**, further comprising generating two-dimensional horizontal or vertical slices of the damaged vehicle so as to compare the two-dimensional horizontal or vertical slices of the damaged vehicle to two-dimensional horizontal or vertical slices of an undamaged vehicle to gauge deformity to underlying components.

6. The method of claim **1**, wherein further comprising detecting damage of the damaged vehicle in cases in which the damaged vehicle has a light color.

7. The method of claim **1**, further comprising detecting damage of the damaged vehicle in cases in which the damaged vehicle has low degrees of surface deviation.

8. The method of claim **1**, further comprising negating a need to position reference points to be placed on the surface of the damaged vehicle.

9. A method comprising:

projecting light pattern on a damaged vehicle to reveal deformation of the pattern;

offsetting from the light pattern, obtaining a shape of the pattern by a camera;

calculating, from the shape, distance of every point in the field of view;

determining using structured-light calculation contours of the damaged vehicle; and

generating two-dimensional horizontal or vertical slices of the damaged vehicle so as to compare the two-dimensional horizontal or vertical slices of the damaged vehicle to two-dimensional horizontal or vertical slices of an undamaged vehicle to gauge deformity to underlying components.

10. The method of claim **9**, further comprising creating a topographic model of the damaged vehicle so as to compare the damaged vehicle to a three-dimensional model of an undamaged vehicle to determine extent of the damage to surface and sub-structures.

11. The method of claim **9**, further comprising immediate electronic payment of a claim estimate to a claimant based on the extent of the damage.

12. The method of claim **9**, wherein determining occurs without using photographic images to determine the extent of the damage.

13. The method of claim **9**, further comprising creating differential heat maps to detect degrees of intrusion, extrusion, or deviation from an undamaged vehicle.

14. The method of claim **9**, wherein further comprising detecting damage of the damaged vehicle in cases in which the damaged vehicle has a light color.

15. The method of claim **9**, further comprising detecting damage of the damaged vehicle in cases in which the damaged vehicle has low degrees of surface deviation.

16. The method of claim **9**, further comprising negating a need to position reference points to be placed on the surface of the damaged vehicle.

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